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CONTENTS.

PAGE

The Surgery of the Posterior Mediastinum; its Past and its Future. By J. D. Faure, M. D., ... 125

Aplastic Anæmia Associated with Lymphoid Hyperplasia of the Bone-Marrow. By George Blumer, M. D., ... 127

Preliminary Communication Regarding an Immune Body Capable of Inhibiting the Development of Cancer in Mice (Adeno-Carcinoma, Jensen). By G. H. A. Clowes, Ph. D., ... 130

A Multiplex Slide-Holding Device. By Edward F. Miller, . . 132

Dr. Heinrich or Henry Keerl, of Baltimore, the "Hessian Surgeon." By Eugene F. Cordell, M. D., ... 133

The Bacillus Aerogenes Capsulatus in Puerperal Infection. By Herbert M. Little, M. D. 136

PAGE

Proceedings of Societies:

The Johns Hopkins Hospital Medical Society, ... 146

A Case of Arterio Venous Aneurism [Dr. Osler];—The Immunization of Mice to Cancer [Dr. G. H. A. Clowes];—Pathological Changes [Dr. Welch];—Apparatus for the Treatment of Fracture of the Femur; Treatment of Esophageal Stricture [Dr. Theodore Dunham];—Peri Pancreatic Abscess [Dr. Thayer; Surgical Treatment, Dr. Finney];—Gastric Tetany [Dr. Howard];—The Pathology of Tetany [Dr. MacCallum;—Synæsthesia [Dr. H. L. Smith];—Hanging Block Cultivation of Bacteria; The Ultraviolet Rays; Thermophilic Bacteria [Dr. Ford];—The Cure of Uterine Cancer [Dr. John G. Clark];—Pathology of Cervical Cancer [Dr. Sampson].

Notes on New Books, ... 150

THE SURGERY OF THE POSTERIOR MEDIASTINUM; ITS PAST AND ITS FUTURE.[1]

By J. D. Faure, M. D., *of Paris, France.*

The revolution which gave to surgery a scope previously unknown and far beyond the dreams of our predecessors, has as yet failed to supply efficient means for the treatment of affections of the posterior mediastinum.

The fact that this region is situated in the depth of the chest between the lungs, before the vertebral column, and behind the bronchia and the superior part of the heart, has, until very recently made it unattainable, and protected it from invasion on the part of even the most daring surgeons.

When abdominal surgery was achieving all conceivable operations upon the uterus and its adnexa, the liver and the bile ducts, the spleen, the stomach, and the intestine; when the surgery of the chest ventured to incise the lungs in order to reach abcesses, or even to extirpate fragments of lung tissue; when the cranium and the vertebral column were opened in order to explore the nerve centers, and evacuate cerebral abscesses, or to extirpate tumors of the spinal cord or of the encephalon; when the anterior mediastinum was entered for the purpose of suturing wounds of the heart, the posterior mediastinum alone still remained inaccessible.

There were, it is true, many bold attempts at its surgery, all or nearly all of which attacked the esophagus either for cancer or for occlusion occasioned by a foreign body. I do not here take into account the few operations performed upon scrofulous abscess, which led surgeons as far as the anterior part of the vertebral column, because although they were actually operations on the posterior mediastinum, they achieved nothing more than the cleansing of a tuberculous abscess, and cannot be considered in the same light as the deliberate opening of that region for the purpose of operating upon the organs which it contains.

Operations of the latter kind have been very rare, and although, in 1888, Wassalow showed for the first time that it was possible to reach the esophagus by resecting a few ribs and separating the pleura from the costo-vertebral groove, the most important publications made since that date have been entirely anatomical. Quénu and Hartmann, and Potarea have investigated the connections between the esophagus and the thorax and demonstrated that in order to reach the former it is necessary to pass either by the left of the vertebral column (Quénu and Hartmann) or by the right (Potarea).

[1] Address delivered at the Johns Hopkins Hospital, April, 1904.

Schwartz has made some interesting researches on the means of reaching the bronchia in order to extract foreign bodies. Lery experimented in resections of the esophagus upon dogs, and Jowet utilizing the same animal, succeeded in affecting the trans-diaphragmatic anastomosis of the esophagus with the cardiac end of the stomach.

Operations upon the posterior mediastinum in human beings, undertaken with a therapeutic purpose, have been very rare. Relm attempted to extirpate cancer, but only succeeded in incising the esophagus. Slobet and Tuffier, the latter operating through the pleura, have also incised this organ, to relieve cicratricial stricture, and Forgue made an effort to extract a foreign body from it, but was obliged to abandon his attempt without opening the esophagus, succeeding only in exploring it with the finger tip. Curtis, in 1886, opened the right bronchus through the posterior wall in order to extract a foreign body, which, after all, he could not reach. Such, unless I am mistaken, are all the operations hitherto performed on the posterior mediastinum. They have all, as you see, been tentative and have ended in failure, or at least terminated in simple incision of the esophagus or the bronchi. However bold and skilful the surgeons who made these attempts may have been no other result was possible, at least in the case of operations upon the esophagus; bronchotomy, performed for the extraction of a foreign body might be successful, but operations upon the esophagus such as those just cited, were foredoomed to failure.

According to Wassalow's method, which all operators are now bent upon following, any extensive operations upon the esophagus are utterly impracticable. It is true that it is possible to reach it after the third, fourth, fifth, and sixth ribs have been resected and the pleura pushed aside, and after it is recognized and grasped with a pair of forceps, a foreign body, impacted at this level, can be extracted. It may also be possible to incise a stricture, but there is not sufficient space for extirpation of the esophagus. In fact, if extirpation is to be attempted, it is best to adopt the transpleural route with liberal opening of the chest, as indicated by Tuffier, though it is a great inconvenience to operate through the pleura and the risks of accident are multiplied by doing so. This method supplies more room, however, and although like those of Wassalow, Potarea, Quénu, and Hartmann it is perilous and difficult, it does not, at any rate, present impossibilities. It is insufficient, it is dangerous, and it is bad, but it is practicable.

For some time I have been strongly convinced that some better method might be devised, for I believed that it was not only possible but easy to open a clear wide pathway to the posterior mediastinum, affording sufficient space to permit the execution of any operation.

It seemed to me that I could best demonstrate this fact by performing the most difficult operation possible, and therefore I undertook the extirpation of a cancerous esophagus situated in what is held to be the most inaccessible region, that is the center of the posterior mediastinum, behind the bifurcation of the bronchia and the pedicle of the lung.

I succeeded in performing this operation without accident, and even without difficulty, and although both my patients died in consequence of unforeseen accidents I believe that I have, nevertheless, demonstrated the possibility of operating successfully on the only part of the human body from which surgeons have heretofore been withheld by a consciousness of impotency.

I do not insist that such operations must be performed exactly as they are described in the *Bulletin de la Societé de chirurgie de Paris* for January 25, 1903, I only wish to insist upon the conditions which are essential to success. One of these is a means of access to the posterior mediastinum sufficiently wide to permit ease of movement and enable the operator to execute all the numerous delicate manipulations and explorations demanded in such an important operation. All surgeons have hitherto obstinately limited the extent of their original opening to the resection of three or four middle ribs, but this is too narrow a means of access and fails to give sufficient space and light. To enable the surgeon to see clearly and fully it is necessary to include the first rib in the costal resection, although this, for some inexplicable reason has heretofore been respected. It is the section of these ribs and particularly of the first one, however, that governs the conditions of the operation. So long as the first rib is intact it is impossible to make any extensive manipulation in the posterior mediastinum, and even if all the other ribs from the second to the eighth, or even the ninth be removed, the first rib still fixes the shoulder and all the adjacent parts of the chest immovably to the vertebral column; if, on the contrary, the first rib is resected or even simply divided, the corresponding half of the chest is immediately loosened from the backbone, while the shoulder is pushed aside to such an extent that it becomes necessary to hold it to avoid wrenching the roots of the brachial plexus. The posterior mediastinum then opens like a book, and nothing is easier, after detaching the pleura and the apex of the lung, than to reach its depths and execute all possible manœuvres. In my operations, conducted after this method, I have been able to explore the posterior part of the trachea and bronchia, to dissect the pneumogastric nerve behind the pedicle of the lung, and to make, in short, all the manipulations necessary to success in a complicated operation such as the extirpation of a part of the thoracic esophagus.

This new technic has brought the most difficult operations on the posterior mediastinum within the range of possibility. Only experience can show what a future is in store for them, but we are at liberty to speculate in regard to it.

It is, of course, evident that this class of operations must always be of a serious character, since the life of the patient is at stake, and they are indicated only in cases where all other means of treatment have been tried in vain and where life is in immediate danger, such as cancer, foreign bodies in the esophagus, or suppurative mediastinitis. In extracting foreign bodies retained in the bronchia, it seems to me that the

usual methods are best, using the Williams bronchoscope for the purpose, or if such means absolutely fail, a simple bronchotomy may suffice. But should the latter operation, which is somewhat obscure, prove unsuccessful, it is obvious that the enlargement of the restricted path afforded by resection of three or four ribs into a wide exploration by section of five or six ribs such as I practice and advise would be indicated as a last resource.

Suppurative mediastinitis, does not often, in my opinion, afford a suitable opportunity to try this final expedient. The signs of the condition are generally too obscure and its evolution too rapid, to render such intervention possible. Under certain conditions, however, it may be necessary to employ it.

The results obtainable in cancer of the esophagus is a question of importance. I do not entertain, with certainty, any hope that cancerous patients can often survive the extirpation of the esophagus many years. But I do not see why the operation should not sometimes be followed by a lasting success.

It is true that my two patients died, both succumbing in the same way after twenty-four hours, without hemorrhage and without fever, but with symptoms which may, I think, be ascribed to slow suffocation. I had thought it necessary to leave a large drain in the posterior mediastinum, and through this, as I could plainly see, a large quantity of air penetrated the mediastinum at each inspiration, producing a genuine extra-pleural pneumothorax, and so lessening, by just so much, the quantity of air entering the lungs. I have had no further opportunity to perform the operation, and to ascertain, as I intend to do, if the suppression of the drain will obviate the symptoms just described. If, as I think possible, this cause of death can be removed, I see no reason why the operation, although undoubtedly a serious one, should not yield results more successful than these to which I have as yet attained, thanks to the technical improvements which new operations always introduce.

Sauerbach (Mickulicz' assistant) has just developed upon animals a method which may, to a certain degree, avoid the accidents I have described as well as those which may result from pneumothorax. He operates in a hermetically sealed box, where a certain amount of vacuum is created. The head of the animal is kept outside. The surgeon and his assistants are inside the box, operating upon the body of the animal, the neck of which is set in a hermetically sealed rubber collar, which prevents communication with the outside air. The excess of pressure inside the lungs communicating with the outer air, on the pressure outside the lungs exercised by the rarified air of the box prevents accidental pneumothorax and allows, so its author claims, the execution of the most complicated operations within the thorax without any danger of opening the pleura. I earnestly wish this method may be successful, but I fear it is very difficult of application to man and I hardly expect to see it in use among surgeons. The point of present importance, in my opinion, is to guard against the danger of extra-pleural pneumothorax, occurring, as I have just described, and to prevent it by suppressing the use of drains.

It is, however, in the extraction of foreign bodies impacted in the thoracic part of the esophagus that posterior thoracotomy will, I hope, give its best results. Under these circumstances, when attempts to extract foreign bodies by the natural channels have failed, this form of thoracotomy should be the operation of choice. In spite of the best guiding marks, the simple resection of the middle ribs may not suffice for the discovery of a foreign body in the thoracic esophagus, and still more is it likely to fail in its extraction. This new technic will permit extraction without difficulty and with every prospect of success.

I should never advise this operation in the case of strictures of the esophagus due to cicatricial tissue. This condition can be relieved by means which are fully as efficacious and less dangerous. A patient whose esophagus has been removed can be perfectly well fed by the more harmless and perfectly sufficient gastrotomy.

The gravity and difficulty of the operation just described are such that it must be reserved, as I have said, for patients whose lives are in immediate danger from cancer or from the presence of a foreign body in the esophagus. I shall consider myself well repaid for my trouble if only one life is saved by means of it. Allow me to add that nothing could please me more than to see one of you perform the first successful operation of this kind.

APLASTIC ANÆMIA ASSOCIATED WITH LYMPHOID HYPERPLASIA OF THE BONE-MARROW.

By George Blumer, M. D.,

Associate Professor of Pathology, Cooper Medical College, San Francisco.

[*From the Pathological Laboratory of Cooper Medical College, San Francisco, Cal.*]

Since Ehrlich[1] described the first case of so-called "aplastic" anæmia in 1888, a number of cases have been placed on record. Up to the time that Senator[2] reported his recent case many writers seem to have regarded the lesions underlying this condition as essentially uniform, though there has been a good deal of discussion as to whether these lesions were to be regarded as a specific pathological entity or merely as a subform of ordinary pernicious anæmia. There is certainly a striking difference between the narrow lesions in

[1] Charite-Annalen, 1888.

[2] Zeitschrift für klinische Medicin. Bd. LIV. Hft. 1 and 2.

Muir's case,[1] in which the marrow was aplastic and fatty throughout, and those in Senator's case, in which it was hyperplastic and lymphadenoid throughout. These cases again differ from those with the ordinary lesions of pernicious anæmia plus aplasia of the bone-marrow. The examination of the bone-marrow in many of the reported cases is comparatively imperfect, and it is therefore difficult to say, positively, under which type many of them are to be placed. As atypical cases are often of value in clearing up doubtful points, we venture to record a case which was observed in the service of Dr. J. O. Hirschfelder in the City and County Hospital. We are indebted to Dr. Hirschfelder for the opportunity to study the case. The following is a summary of the important points in the clinical and pathological history of the case:

P. D., male, a laborer by occupation, was admitted to the Hospital November 4, 1904, complaining of general weakness and shortness of breath.

His family history was negative. Aside from a definite history of an attack of lues thirty years ago his past history was unimportant. His present illness began one year and ten months prior to admission. He dated it from the passage of a considerable quantity of blood from the bowel as a result of hemorrhoids. Since then he has had occasional passages of blood, but only when constipated. As far as can be judged the quantity of blood lost in this way has not been great. Aside from his rectal trouble he has had no symptoms of note until eight months ago when he began to have gastric disturbances. Since that time he has vomited a good deal, at times as often as thrice daily. At no time has he vomited blood. At the same time he has suffered from a progressively increasing weakness and shortness of breath. He has lost ten or twelve pounds in weight since the beginning of the illness.

Examination shows a well developed and moderately well nourished individual with a distinctly yellowish pallor. The chest is fairy well formed. Aside from the usual physical signs of emphysema the lungs are negative. The area of cardiac dullness is not enlarged, and the heart sounds are clear. The second pulmonic sound is accentuated. The liver dullness measures 12 cm. in the mammillary line, the edge of the organ is palpable. The spleen is not palpable. The lymph nodes throughout the body are slightly enlarged. There is a projecting external hemorrhoid, and rectal examination shows a number of internal hemorrhoids and a sloughing ulcer on the right wall of the rectum.

Smears from the blood show slight variations from normal in the size of the red corpuscles. There are a very few macrocytes most of which show polychromasia. A moderate number of microcytes are seen. Poikilocytosis is present but not marked. An occasional red corpuscle shows granular degeneration. There is very evident leucopenia. The predominating type of leucocyte is the small mononuclear form, and 80% of these are typical small lymphocytes. The remainder differ from them only in slight irregularities of the nucleus, and in the possession of a greater amount of protoplasm containing an occasional basophile granule. Hardly any blood plates are to be made out. The following table shows the result of the blood counts:

	Reds.	Leuc.	Hb.	Poly.	L. Mono.	S. Mono.	Eos.	Bas.
5th	....	..	6.0%	4.5%	89.5%	0	0
7th	1,516,000	4,600	20%	10.3%	1.3%	88.3%	0	0
8th	1,304,000	....	20%	8.0%	1.5%	90.0%	0	0.5%
9th	....	..	7.5%	2.0%	90.5%	0	0
10th	1,100,000	2,450	..	7.5%	2.0%	90.5%	0	0
14th	1,204,000	4,200	22%	7.5%	2.25%	90.25%	0	0

[1] British Medical Journal, 1900, Vol. II, page 909.

An average of one nucleated red to each differential count was observed. The cells were all of the normoblast type, or but slightly aberrant. No definite megaloblasts were seen.

The stomach analysis shows an absence of free hydrochloric acid, a trace of lactic acid, and microscopically a few large bacilli.

The urine contains no albumen or sugar, microscopically a few leucocytes and a few granular casts are present.

The feces contain no parasites or ova.

During the time the patient was under observation there was an irregular temperature ranging between F. 100 and F. 103.5. The patient died thirteen days after admission with signs of bronchopneumonia.

The autopsy was made by Dr. Wm. Ophüls, three hours after death. The following notes are abstracted from the protocol:

Heart.—The pericardium contains 70 cc. of clear fluid. The heart muscle is dark brown and firm. The valves are normal.

Lungs.—There is marked diffuse emphysema. There are easily torn adhesions at the apex of the left lung, and a small scar in the lung beneath them. The upper part of the left lung shows localized œdema and hyperæmia. There is a small scar at the right apex. On the right side there are larger areas of œdema and hyperæmia, and some consolidated spots. There is an encapsulated caseous area a little below the right apex.

Liver.—The organ measures 16 x 27 x 6 cm. It is dark brown in color. Over the anterior part of the right lobe there is a circumscribed thickening of the capsule with a small scar in the liver tissue beneath. The gall-bladder is large, and filled with clear, light yellow bile containing a few dark flakes.

Spleen.—The organ measures 10.5 x 2.5 x 2.5 cm. The markings are very definite. There are some barely visible brown spots in the pulp.

Kidneys.—The left measures 11 x 5.5 x 3 cm. The capsule is firmly attached. The tissue is pale and slightly brown. Right kidney same as left.

Adrenals.—Both are small and dark brown in color.

Genitalia.—Marked atrophy is present in the external genitals. There are large white scars in both testes.

Stomach.—The organ contains thin yellow fluid. The mucous membrane shows slight atrophy.

Intestines.—The duodenum contains bright yellow contents. The jejunum is normal. There is marked atrophy of the ileum and colon. The upper end of the rectum is contracted. At the anus there are several external hemorrhoids, the largest 2.5 x 1.5 cm. Extending 5 cm. up the rectum is a large irregular ulcer with partly brown, partly yellow necrotic masses at the bottom. At one place the ulcer has perforated into the peri-rectal fat.

Aorta.—There are a few yellow spots in the intima.

Lymph Nodes.—There are some moderately enlarged, reddish-gray lymph nodes in the supra-clavicular space. The peri-bronchial lymph nodes contain calcified areas. The retro-peritoneal hæmolymph glands are slightly enlarged, and dark red in color.

Bone-marrow.—The bone-marrow in the upper part of the right tibia is yellow and fatty. There is partly red and partly yellow marrow in the upper end of the left humerus and the lower end of the left femur. The vertebral marrow shows no marked change to the naked eye.

Bacteriologic.—The cultures from the lung show the diplococcus lanceolatus associated with the bacillus of Friedländer and the bacillus pyocyaneus. The cultures from the liver, spleen, and kidney show the bacillus pyocyaneus with the colon bacillus.

The following were the important points brought out by the histologic examination:

Heart.—The right ventricle shows a moderate degree of fatty infiltration. The left ventricle shows well-marked brown atrophy.

Lungs.—The usual appearances of emphysema, œdema, and hyperæmia are present. In the consolidated areas the lesions of broncho-pneumonia are found, the predominating cells in the exudate being polynuclear leucocytes.

Liver.—Marked brown atrophy is present. The pigment, which is present in considerable amount, follows the course of the bile capillaries. It does not give the iron reaction.

Spleen.—There is periarteritis of most of the splenic vessels. The lesions of chronic passive congestion associated with an early chronic interstitial splenitis are present. There is a little brown pigment in the pulp which does not give the iron reaction.

Kidneys.—Both kidneys show a few patches of atrophy in the cortex. There is a moderate degree of cloudy swelling.

Testicles.—There is atrophy of the glandular tissue associated with patches of dense scar tissue.

Stomach.—There is a moderate degree of atrophy of the mucosa.

Intestines.—The mucous membrane of the ileum shows a moderate degree of atrophy. The ulcer of the rectum shows a base made up of granulation tissue; this is capped by a necrotic layer in which a few polynuclear leucocytes are present.

Lymph Nodes.—There is slight hyperplasia. The hæmolymph glands do not show any evidence of increased blood destruction.

Bone-marrow.—Smears from the tibia showed only blood having the same characteristics as that from the peripheral circulation. Smears from the vertebral marrow show a marked hyperplasia of the lymphoid elements, and almost complete absence of nucleated reds. The predominating cell is a mononuclear element about the size of the small mononuclear cell of the circulating blood. This cell has a large, pale-staining, centrally-situated nucleus, with a narrow rim of protoplasm which stains but little darker than the nucleus, and is at times scarcely distinguishable from it. Granular cells are almost absent, those most numerous being mononuclear cells with small, thickly-clustered, basophilic granules. Nucleated reds are very scarce, only 15 being seen in a count of 3200 cells. These were all of the normoblastic type. A count of 3200 cells gives the following:

Small Mononuclear cells	98.52%
Large Mononuclear cells	.28%
Polynuclear leucocytes	.03%
Polynuclear eosinophiles	.03%
Neutrophile myelocytes	.18%
Basophile myelocytes	.21%
Atypical forms	.75%

The sections of the bone-marrow confirm these findings. The marrow from the tibia consists entirely of fat; that from the lower end of the femur, and from the vertebra shows marked lymphoid hyperplasia, most marked in the vertebral marrow. In both of the last named sections the almost complete absence of nucleated reds and granular leucocytes is apparent.

From a clinical standpoint this case presents all of the leading characteristics of progressive pernicious anæmia: the yellow anæmia without much emaciation, the gastro-intestinal symptoms, the progressive weakness and dyspnœa, and the lack of physical findings. Yet neither the blood picture nor the pathological findings correspond to those of ordinary pernicious anæmia. The blood, in fact, shows none of the changes which are ordinarily found in pernicious anæmia except the progressive character of this anæmia, and the leucopenia with the relative increase in the mononuclear leucocytes. The great variation in the size of the red cells, the presence of megalocytes and megaloblasts, and the high color-index are lacking. The picture presented corresponds to that originally described by Ehrlich in 1888 as "aplastic" anæmia. As the name indicates there is, in such cases, a lack of evidence in the blood of any attempt on the part of the bone-marrow to compensate for the loss of blood corpuscles. The picture presented by the peripheral blood is that of a progressive loss of red corpuscles without any marked variation in the size or shape of the cells, and without the presence of nucleated reds. The leucocytes are usually diminished in number, and there is a relative increase in the mononuclear forms with almost complete absence of cells with granular protoplasm. The pathological lesions in our case do not correspond to those found in cases of the Ehrlich type, in fact, instead of a simple aplasia the bone-marrow showed in places a hyperplasia of the mononuclear elements.

Since Ehrlich's case was reported a number of cases have been recorded in which the blood picture was similar. A study of these cases from the pathological side shows that the essential lesions are not in all instances alike. Three main groups may be recognized: (1) Those cases in which the lesions are those of progressive pernicious anæmia. (2) Those cases in which the bone-marrow shows primary (?) aplasia. (3) Those cases in which there is a hyperplasia of the mononuclear elements of the bone-marrow. There is also evidence to show that in one condition which is usually followed by recovery, Barlow's Disease, a blood picture essentially similar to that of aplastic anæmia may be present, and autopsy may show aplastic marrow. This simply indicates that the condition which we clinically term aplastic anæmia is not a pathological entity, but may be due to a variety of causes.

In cases in which the bone-marrow is aplastic throughout there is little difficulty in explaining the blood picture. The same is true of cases of pernicious anæmia with aplasia of the bone-marrow. The actual cause of the aplasia is still obscure. Possibly it is due to conditions similar to those seen in severe infections without leucocytosis, i. e., the causative irritant is of exceptional intensity or the individual power of regeneration is excessively low.

In cases of the character of the one here reported, and the cases of Senator and Wolff[4] seem to be the only similar ones, the blood picture is more difficult of explanation, and the exact nature of the bone-marrow changes is open to discussion.

The explanation of the blood picture in Senator's case does not seem so difficult as in our own, as in his case the bone-marrow was hyperplastic throughout. In this case it might be supposed that the anæmia was due to a crowding out and replacement of the erythroblastic elements such as occurs, according to Dock and Warthin,[5] in chloroma, and presumably in other forms of leukæmia. In our case, however, the shafts of the long bones showed no lymphoid hyperplasia, and it is necessary to assume either that two distinct processes, lymphoid hyperplasia and aplasia, were going on at the same time, or that the hyperplasia, though only partial, caused all the

[4] Wolff: Berliner klinische Wochenschrift. Jahr. 42, No. 2, 1905.

[5] Trans. of the Association of American Physicians, 1904.

changes. The latter seems to us the more probable. One hypothesis which Senator advances seems to explain both the hyperplasia and the anæmia much more satisfactorily than does a mechanical replacement and crowding out. This explanation is, that the lymphoid cells which have undergone hyperplasia represent the parent cells from which should arise both the red corpuscles and the granular leucocytes. It is easily seen that if these cells fail to go through their normal cycle of existence, and instead undergo proliferation unchanged, neither red cells nor granular leucocytes could be produced. Why in our case there should be no regenerative changes in the marrow of the long bones is more difficult to explain unless we assume that when this marrow regenerates the regeneration takes place by the emigration of leucocytes from pre-existing red marrow. Perhaps the same cause which produces the loss of differentiating power in the parent cells also leads to a loss of power to emigrate, though Senator's case does not support this view.

Query as to the exact nature of the bone-marrow hyperplasia in these cases brings up the whole subject of the pathology of leukæmia and allied conditions. Senator regards his case as a pure myelogenous pseudoleukæmia and our case closely resembles his. The relation of such cases to lymphatic leukæmia is still doubtful. There are cases on record in which the blood picture is said to have changed from that of pseudoleukæmia to that of leukæmia, and there are cases of lymphatic leukæmia in which the leucocytes have dropped to normal, or even below normal, before death. Inasmuch as the ordinary lesions of leukæmia were wanting in the internal organs in this case it might seem improper to class it with this disease, though the bone-marrow changes correspond closely to those found in cases of lymphatic leukæmia without enlargement of the lymph nodes. If we follow Warthin's[6] recent classification of the leukæmias, based on the theory that the essential lesion is a neoplasm of the leucoblasts, the case would be classed as a nonchloromatous aleukæmic leucoblastoma, and such we believe to be the most rational interpretation of it. After all the classification of this group of diseases must rest upon the pathological findings, and not upon the clinical picture and the changes in the blood in the peripheral circulation. The mere fact that in one case the proliferated cells gain access to the circulation while in another they do not, may serve as a basis for clinical classification, but does not alter the fact that the underlying pathological condition in both classes of cases is essentially the same.

[6] Trans. of the Association of American Physicians, 1904.

PRELIMINARY COMMUNICATION REGARDING AN IMMUNE BODY CAPABLE OF INHIBITING THE DEVELOPMENT OF CANCER IN MICE (ADENO-CARCINOMA, JENSEN).[1]

By G. H. A. Clowes, Ph. D., *Gratwick Research Laboratory.*

This communication deals with one phase of an investigation which is being carried out at the present time by Dr. H. R. Gaylord and myself, assisted by Mr. F. W. Baeslack.

A considerable number of authentic cases of recovery from cancer in human beings are recorded in the literature but no attempt has apparently been made to test the effect exerted by the serum of such recovered cases upon tumors of like nature in other individuals. We have not up to the present been able to procure human cases of a type suitable for experiments of this nature, but the possession of a series of readily transplanted mice tumors, some of which recovered spontaneously has afforded us an opportunity of making some preliminary investigations regarding the influence exerted by the serum of those mice which have recovered upon rapidly developing tumors in other mice.

In the spring of 1904 Dr. Gaylord visited Copenhagen and received through the courtesy of Professor Jensen of the Veterinarian High School in Copenhagen a couple of white mice inoculated with tumors described by Jensen as adeno-carcinoma (Centralblat f. Bakt. Vol. 34). These mice died shortly before reaching Buffalo but transplantations from one of them were successful, twelve out of twenty-four mice developing tumors in the course of three or four weeks, thus affording ample material for the subsequent inoculation of a large number of normal mice.

We did not in the course of these early experiments observe any marked hereditary tendencies. In some cases an exceptionally large percentage of tumors were obtained on inoculation of the offspring of mice that had themselves exhibited a considerable resistance to inoculation. Great difficulty was at first experienced in transplanting this material to gray mice but in the course of the autumn the inoculation of a batch of sixteen young gray mice (the offspring of non-susceptible parents) resulted in the production of ten rapidly and excessively virulent tumors which, as will be seen later, were of great value in maintaining the tumor series.

Early in July a series of experiments made with a view to determining certain physical and chemical constants was commenced, but received a serious check a couple of months later when the discovery was made that a considerable number of unused small tumors had undergone spontaneous retrogression, the mice having recovered entirely and showing no tendency to fresh development of cancer. At the time at which this incident occurred the number of actively growing tumors was too small to permit of any of them being employed to test the efficiency of the serum of the spontaneously recovered mice immediately after the disappearance of the tumors, but a

[1] Presented to the Jonhs Hopkins Medical Society of Baltimore, January 16, 1905.

month later, the series having been once more established through the successful inoculation of the young gray mice referred to above and of certain other white mice, it was possible to commence work of this nature. A series of experiments was then undertaken making use of both gray and white mice having tumors varying from the size of a pea to that of a large cherry. In every case two mice derived from the same source, inoculated at the same time and having tumors of about the same size, were used for comparison, one receiving a dose of the blood obtained by killing one of the spontaneously recovered mice, the other receiving an equivalent dose of normal mouse blood. A marked effect was exerted by the immune serum on small tumors, three of which about the size of peas disappeared in four or five days, residues consisting almost entirely of connective tissue being all that was to be found on subsequent operation. A larger tumor about the size of a cherry treated in the same manner diminished considerably in size, became harder and remained stationary in its development, was removed successfully by operation and has not recurred in the course of the last month. A microscopic examination of the tumor in question showed a marked increase in connective tissue with destruction of the greater portion of the cancerous epithelium. A still larger tumor was retarded in its development, reduced slightly in size and eventually one-half removed by operation, the remainder being left for further developments. (A considerable amount of blood was lost at the operation, the animal was subsequently bled for other purposes and eventually, the treatment with immune serum having been suspended, the tumor once more developed and formed local metastases.)

Tumors weighing more than three or four grams were not appreciably affected by the serum, but the cachexia from which the mice suffer in the last stages was in all cases noticeably alleviated. The tumors in the control mice referred to above which had received the normal serum were unaffected and developed in the usual manner leading eventually to the death of the animals. The serum of the mice cured of their tumors by the above treatment was found to possess a certain degree of activity, in one case causing the disappearance of a tumor as large as a buckshot in less than two days, but it can scarcely be said to have exhibited as great a degree of activity as did that which was obtained from certain spontaneously recovered mice. The activity of the serum of spontaneously recovered mice varies apparently within very wide limits. Whilst in two cases .2 cc. produced a marked effect on tumors weighing from two to three grams in two or three days, in the majority of cases only smaller tumors were influenced and in four or five of the spontaneously recovered mice no serum activity whatever was to be noted.

Up to the present (January 15) experiments have been carried out on twenty mice. Of those treated with repeated doses of the so-called immune serum one only has failed to show some effect which may be attributed to the serum and all are still living. Of those treated with equivalent doses of normal serum, five are already dead and the remaining mice have tumors exceeding in size those of the mice for which they served as controls.

It must of course be borne in mind that these mice tumors are very irregular in their development some appearing within a fortnight and others as late as five months after inoculation; some developing so rapidly as to reach dimensions almost equal to those of the mice themselves and causing the death of the animal in a fortnight's time, whilst others develop much more slowly not producing a fatal result in less than ten or twelve weeks. With such variations under normal circumstances the greatest precautions must necessarily be observed in drawing conclusions from the above experiments but it must be remembered that at the time at which they were carried out, the tendency to spontaneous recovery was far less than in the previous generation; also that only in one case has a tumor larger than a buckshot been known to recover spontaneously.

Apolant in a communication from Ehrlich's laboratory regarding the influence of radium on mice tumors makes no mention of having tested the serum of cases which had been cured. (Deutsche med. Wochenschr. 24 March, 1904.) Not having radium of sufficient activity at our disposal we have exposed a series of tumor mice to the x-rays and in three cases in which fair sized tumors were cured by this treatment the serum when tested was found to produce no appreciable effect upon other tumors.

A series of test tube experiments carried out to determine the nature of this serum make it appear extremely improbable that it can be classed in the category of cytolysins. In any case it does not exert a more marked hæmolytic effect than does normal serum or the serum of a mouse dying of cancer.

Sections of tumors which have undergone partial spontaneous retrogression show changes in the epithelium closely allied to simple atrophy. The connective tissue stroma of the tumor is greatly increased in amount and if the tumor is not removed for a few days nothing is found but a connective tissue nodule containing isolated masses of degenerating coalescing epithelial cells. The tumors inhibited in growth show about the periphery a marked increase in connective tissue stroma with extensive round-celled infiltration, characteristics which are not to be found to the same extent in the growing tumors. Disintegration of cancer nests associated with atrophy of the epithelium and the formation of coalescent masses of the latter cells characterize those tumors which have been successfully treated as well as those which have recovered spontaneously. Minute masses of connective tissue presenting the characteristics of ordinary organizing connective tissue are frequently all that is to be found a few days after treatment of a small tumor. In general, it may be said that the changes found in the spontaneously cured tumors and in those inhibited or cured with the immune serum, correspond fairly closely to the changes already described by several authors as indications of partial spontaneous recovery from human cancers.

Whilst it is to be hoped that work of a similar nature may eventually lead to the discovery of a means of treating human cancer, it must be borne in mind that the proportion of spontaneous recoveries in mice, which amounted in the course

of our work to 15 or 20 per cent is so far as we know, infinitely greater than the percentage of such recoveries in human beings. Also, whilst the microscopic appearance of the tumor has remained unchanged, it is impossible with the limited data at our disposal to estimate at present the effect which may have been exerted by repeated transplantations of the tumor material from one mouse to another, amounting to at least thirty generations from the first Jensen mouse. In any case it appears probable that a combination of circumstances has in the course of our experiments, led to such a modification of the original conditions as to render it possible for a relatively slight immunizing factor to exert sufficient influence to turn the scale in favor of the normal protective forces of the animal.

The point upon which we would lay special stress is the evidence afforded by the above experiments of the existence of immune forces antagonistic to the development of cancer.

A MULTIPLEX SLIDE-HOLDING DEVICE.

By Edward F. Miller.

(From the Hearst Anatomical Laboratory, University of California.)

Anyone who has had much experience in staining a large number of paraffin sections for class use or research work has been impressed with the enormous waste of time and energy in preparing these specimens. Not only is the process expensive from the view-point of the labor involved, but also on account of the waste of re-agents and alcohols. Of the various mechanisms that have been devised to obviate these difficulties, perhaps the most successful hitherto have been special dishes so constructed as to prevent the slides from rubbing against each other and designed as well to be economical in the quantity of fluid used. While these dishes have solved the problem to some extent, the technician has never been able thus far to handle more than a single slide at once. It has seemed, desirable, therefore, to place on the market a simple device, which I have designed to make it possible to treat a large number of slides bearing paraffine sections at one time and to keep them as well in such a small compass as to minimize the waste of stains, re-agents and alcohols in the process of mounting.

The Multiplex Slide-holding Device consists of a series of perforated vulcanized-rubber plates placed in a holder so that they may be clamped against a metal plate by means of a thumbscrew. The device is exceedingly simple, is not acted upon by any of the re-agents used either in the simple or complex methods of staining, is easily cleaned, and, when ordinary precautions are taken, is practically indestructible. From an inspection of the illustration, the method of using the apparatus is at once self-evident, although there are worth noting one or two points concerning its use which may save the technician some time and trouble. The holder has a carrying capacity of 26 slides, which should be placed between the vulcanized-rubber plates and then clamped securely by means of the thumbscrew. Care should be taken to place the side of the slide bearing the sections towards the part of the holder marked "Front," for not infrequently after the preparation is complete it is difficult to determine which side of the slide the sections are on. This simple precaution prevents the possibility of sections being rubbed or injured. It is, of course, obvious that this point is of the utmost importance in the preparation of serial sections, where the loss of a single one may destroy the value of the entire series. It is not advisable to clamp the slides between the vulcanized plates back to back in order to increase the capacity from 26 to 52, for capillary attraction draws the fluid between the slides whence it is difficult to extract it by the ordinary processes of diffusion and consequently stains or water are carried to the higher alcohols or even to xylol, thus preventing the subsequent clearing of the sections. If it is necessary to handle more than 26 sections at once, it is advisable to use two

or more holders. In the ordinary methods of preparation, that is to say, with the commoner nuclear stains and contrasts, the holder with 26 slides may be taken directly through the stains as an ordinary section without any precautions being taken; but in the more complex special methods of staining, the time element, particularly in tissues fixed by different methods, is often of importance. Under these circumstances it is advisable to carry a test slide through the stain in order to determine the exact time required to get the desired result. After this is done the holder with the large number of slides is treated exactly like the control. In this way 27 slides may be stained in the time ordinarily consumed in preparing two.

The results, furthermore, are absolutely equal, as the unequal intensity of stain that is sometimes embarrassing in careful work is thereby obviated. In my experience, it is not necessary to leave the slide-holder laden to its maximum capacity in the re-agents longer than one would leave a single slide. This is particularly true if it is moved about in order to bring fresh fluid in contact with the sections. Care should be taken not to allow either stains or the lower alcohols to come in contact with the slide-holder. This is easily done if the level of the fluid in the baths is adjusted so as to keep it 4 or 5 mm. below the slide-holder. When the staining and subsequent dehydration is almost complete, the slide-holder is inverted in absolute alcohol in order to remove any possible water that may have come in contact with the holder. After removal from the absolute alcohol the thumbscrew is loosened and again inverted in the xylol bath. As soon as the clearing is complete, the slides may be removed directly from the bath one by one and mounted; the portion of the holder marked "front" determining, of course, the side of the slide to which the sections adhere. As the slide-holder is taken from one bath and placed in another, it is always better to drain the slides by touching the free ends to filter-paper, blotter or some other absorbent medium. This precaution, of course, prevents the waste of re-agents. It may be mentioned that the prolonged action of xylol softens the vulcanized rubber; but the entire holder can be immersed in xylol repeatedly for a time sufficient to clear any set of sections without injuring it in the slightest. The construction is so simple that it can be very easily taken apart for the purpose of cleaning and drying, a precaution which will naturally prolong the life of the instrument.

Two types of jars have been found serviceable in our experience to hold the stains and re-agents, one a battery jar with a glass lid and the other a round dish with a metallic screw-top. The battery jar has the advantage of using a small amount of fluid, which is particularly desirable when the more expensive stains are used. It is, indeed, possible to economize still more by immersing the slides in a deep Stender dish, which will hold a dozen or more of the slides. Although the round jars with screw-tops take a greater volume of liquid, I have found that owing to the tight screw-tops, in the end, they are quite as economical as the square dishes owing to the prevention of evaporation. The same bath consequently may be used for a greater length of time than in the case of the battery jar.

The instrument is manufactured by the Spencer Lens Company of Buffalo, New York, and is sold by them. In case the vulcanized rubber deteriorates it may be purchased separately. To sum up the advantages of this apparatus, we may say that:

First: 26 slides bearing paraffine sections may be stained and mounted with but a slightly greater expenditure of time than is consumed in staining and mounting a single section.

Second: There is a great saving in the quantity of re-agents used when the slide-holder is employed.

Third: There is no danger of injuring the sections. The entire series can be mounted without the loss of a single section.

Fourth: The staining of the entire set is absolutely uniform, a result impossible to obtain by the old method.

Fifth: The apparatus is so constructed as to be, with ordinary care, almost indestructible.

Sixth: By the use of this holder it may be possible to give to classes in microscopic anatomy sections stained by the more complex methods owing to the economy of time and re-agents.

DR. HEINRICH OR HENRY KEERL, OF BALTIMORE, THE "HESSIAN SURGEON."

By Eugene F. Cordell, M. D.

We have all read of the famous Hessian troops who fought against us in the Revolutionary War. The name has always had a very bad odor among us, for why should these Germans leave their own homes to fight the battles of a nation and a war in which they had not the least interest. We forget that those were the days of absolutism, when men, as Frederick the Great said, were esteemed little more than cattle. There is ample evidence that many of these men sympathised with patriots who were fighting for their freedom from foreign oppression and would have exchanged sides if they had dared.

It is not generally known perhaps, that one of these Hessians, a distinguished surgeon, settled in this city, and after a long, honorable and successful career died, leaving many prominent and influential descendants here.

Dr. Keerl was descended from a Bavarian family, of the higher class, which could trace its lineage back to the beginning of the sixteenth century. He was born in the town of Mainbernheim, thirteen miles from Würzburg, in the year 1755. He was the only child of his parents who survived, two brothers having died in infancy. Early losing his parents, he was educated by a wealthy uncle, a widower without children, whose wealth according to expectation he was to inherit. He adopted the profession of medicine, completing his studies at the University of Göttingen, then sharing with Halle the supremacy of the German universities. Meanwhile his uncle married again, thus dissipating his prospects of affluence. About this time the American war broke out and the British Government hired the soldiers of some of the petty German princes to aid them in subduing their rebellious colonies. By his uncle's influence, Dr. Keerl obtained a commission as surgeon in one of these "Hessian Regiments" (as they were called), commanded by Colonel von Rall. He left Germany with his command more in a spirit of adventure than from any definite purpose of life, and expecting to re-

turn at the end of his term of service. But "Der Mensch denkt's, Gott lenkt's," and it was destined that he should not see his native land again.

The employment of the troops of the Rhenish principalities by George III is an episode of the American war of great interest and I have already alluded to it at length in a paper read before the German Historical Society entitled, "A Memoir of John Peter Ahl, Surgeon's Mate in the Continental Army." Dr. Ahl also probably came over with the Hessians, at any rate he was in the British service. Early in the war he espoused the cause of the patriots, served them faithfully and was severely wounded while defending some of their sick and wounded from an attack of Tarleton's dragoons at White Plains on the Hudson. After the war he settled in Baltimore and died here in the same year as Dr. Keerl.

The treaty between George III and the Landgrave of Hesse Cassel, dated January 15, 1776, calls for 12,000 men of the troops of Hesse to be employd in the former's service, consisting of four battalions of grenadiers of four companies each, fifteen battalions of infantry of five companies each, and two companies of chasseurs. Part of this force was to be ready to march February 15, 1776, and the remainder four weeks later, if possible. These troops formed a part of the army of General Howe operating against Washington from New York and were under General Heister, who was recalled after the Trenton affair. Over 4000 Brunswickers under General Riedesel were assigned to the army operating from the direction of Canada under Burgoyne and surrendered with that general at Saratoga. The exact number of German troops hired by Great Britain was 16,900.

The brigade of von Rall, consisting of his own, von Knyphausen's and von Losberg's regiments, had covered itself with glory in the campaign of 1776, taking conspicuous part in the battle of White Plains and in the storming of Fort Washington on the Hudson. As a reward for this distinguished gallantry, to it was assigned the post of honor at the close of the campaign by being stationed on the farthest outpost—that directly in front of Washington's army. It occupied the best winter quarters at Trenton.

It is well known how von Rall, elated by his successes, and sharing the opinion, general throughout the British army, that Washington was crushed and the war virtually at an end, neglected the commonest dictates of prudence. Although within but a few miles of a hostile force and although warned, he refused to believe that he was in any danger or that precautions against attack were called for. Well, suffice it to say, that after a Christmas spent in drinking and festivity, von Rall and his men retired to their heavy slumbers to be aroused early the following morning by Washington and his men who had crossed the Delaware and surprised them. Von Rall, hearing the firing, rushed from his quarters and bravely attempted to form his command, but was wounded at the beginning of the action. It is said that he fell into the arms of Dr. Keerl and expired shortly after, entrusting to his surgeon for his wife his watch and sword. The Germans endeavored to retreat but were cut off and captured, suffering a loss of 17 killed, 78 wounded, and 868 prisoners.

So depressed had become the spirits of the Americans that they would not believe that the Hessians had been beaten, and Washington had to march his prisoners through the streets of Philadelphia in order to convince his countrymen. The prisoners were marched to the interior of Pennsylvania for safety. The officers petitioned to go with them but were not allowed to do so; they were sent on the 6th of January, 1777, to Baltimore, where they were paroled. Dr. Keerl spent some time traveling through the country, no doubt with a view to permanent location. At one time he and a friend visited the Carolinas and, according to family tradition, "were solicited to remain and marry among the rich widows whose husbands had been killed in the war." But having formed agreeable acquaintances and finding a favorable opening in Baltimore, he settled finally here about the year 1782, and devoted himself with industry to his profession, meeting with the success which his assiduity and professional acquirements entitled him to. His residence was at 17 West German Street. His experience in the service and the reputation he had acquired as a surgeon were of great advantage to him and brought him forward especially in the line of surgery. He rapidly acquired practice and friends among the best people in the town. In connection with his profession he had a drug store, which was situated on Baltimore Street near Sharp. In the *Maryland Journal* of August, 1789, he advertises the sale of medicines and instruments at the "Sign of the Golden Swan, upper end of Market Street, near Congress Hall." He also kept for sale glassware of all kinds.

From the time of his settlement in Baltimore, Dr. Keerl seems to have had an uneventful life, moving as Horace says,

> "With soul serene amid the nooks
> And silent by-ways of a blameless life."

He early became a member of the Medical and Chirurgical Faculty of Maryland. That he was a Lutheran seems probable from the name "Heinrich Keerl," appearing in the list of contributors to the building of the Gay Street Church, finished in 1808. [See Dr. Scheib's article on the Early Lutheran Church in Baltimore, Transactions of the German Historical Society, Vol. I.] He invested his earnings in real estate, and at his death, which occurred on the 6th of July, 1827, he left to his family a very considerable fortune, which was divided equitably by will among his heirs.

He was twice married; first in early life to Anna Maria, daughter of Jacob Myers, a prominent merchant of Baltimore and one of the founders of the German Presbyterian Church which stood for many years at the corner of Baltimore and Front Streets. His second wife was Margaret Kandel, of Frederick, Md. By his first marriage he left four sons, viz.: John C., Samuel, George H., and Joshua. The first-named was educated in Germany, receiving from his professors there the highest testimonials to his character and attainments. He began life as a merchant, took part in the battles of Bladensburg and North Point, and retired from business in middle

life. Samuel was a director in the Firemen's Insurance Company and for a long period president of the first Baltimore Hose Company, composed entirely of leading young men of Baltimore, and especially of representatives of the principal Quaker families. He also participated in the War of 1812. Gorge H. was of the firm of Henry Keerl & Sons, wholesale druggists, Baltimore Street near Howard, and carried on this business up to his death; he left six children. George H. and Joshua were partners and also married sisters, but the latter died early and left no issue; the other two brothers never married. One of the daughters of George H. married Dr. Robert Atkinson, of Baltimore.

By his second marriage, Dr. Keerl left three children, of whom William pursued medical study in Paris, married Ellen Douglass, of Maryland, a daughter of Colonel Douglass, of the Revolution, and moved to Charlestown, W. Va., where his descendants now reside. One of his sons was killed in the Confederate Army. Charles, the second son, settled in Hagerstown, and Amelia married Dr. Robert Fulton, of Baltimore, and left two sons, one of them, Dr. Henry Keerl Fulton, a graduate of the University of Maryland, who lived in Washington. Dr. Keerl's second wife died in 1866.

Of the German branch of Dr. Keerl's family, a distinguished representative recently resided at Schloss Liebersteen, near Augsberg, Germany, and other descendants and members were not many years ago residing at Nuremberg, and heartily welcomed their American relatives who visited them there. Before his death Dr. Keerl had a very beautiful monument erected over the grave of his mother.

The descendants of Dr. Keerl in Baltimore have in their possession an oil painting of him said to be by one of the Peales; also an old German bible, his sword and letters and pictures of Mainbernheim and of the University of Göttingen, where he was educated. At one time they also had his pair of pistols, but they have been lost. The portrait represents a robust, vigorous man of forty-five or fifty years, with full, clean-shaven, oval face and ruddy complexion; a handsome face, full of intelligence and character.

The following obituary notice of Dr. Keerl appeared in the Baltimore papers at the time of his death: "On Monday evening, 16th inst., Dr. Henry Keerl, in the 73d year of his age. Dr. Keerl was one of the oldest inhabitants of Baltimore, and the respect due to his memory may be safely left to the decision of his fellow-citizens. Plain and unoffending in manners, conscientious and just in his dealings, benevolent and liberal on all proper occasions of public or private charity, he enjoyed and deserved the entire confidence, esteem and good will of all to whom he was known. At that solemn crisis when the world was fast fading from his view, he contemplated the close of his earthly career with calmness and resignation. To him who can look back on a long life spent in the habitual practice of piety and virtue, death is disarmed of all its terrors." [*Baltimore Gazette and Daily Advertiser*, July 18, 1827.]

Dr. Keerl's will is dated November 8, 1823. He leaves his wife, Margaret Keerl, $1200 per annum for life out of the rents of his two warehouses or stores on the south side of Baltimore Street, one occupied by George H. and Joshua S. Keerl, druggists; the other by Samuel Keerl, as a dry goods store; if these rents be not sufficient, the amount is to be made up from his ground rents. He also gives her his house and lot in German Street, as long as she remains a widow. To his sons William and Charles he gives $10,000 each. To his daughter Amelia Henrietta he leaves the interest arising from 66 shares of stock in the Bank of the United States and 12 shares of stock in the Bank of Baltimore, the said shares to go to her in trust at the age of 18. Also to this same daughter a negro girl who is to have her freedom at the age of 44, his piano-forte and one-half of his household and kitchen furniture. He also leaves to his wife one-half of his household and kitchen furniture and two negroes who are to be free at the age of 44. He authorizes his executors to lease his unimproved ground for 99 years, renewable forever. After the above dispositions, the rest of the estate is to be divided into seven equal parts, one of which is to go to each of his sons, viz.: John C., John Samuel, George H., Joshua S., William, Charles F., and to his daughter Amelia Henrietta. He explains that he has already previously given to each of his four oldest sons $10,000, and has also allowed to his son George H. $4000 in addition for his conduct of the business theretofore pursued by him. Finally, he appoints his friend Charles Bohn and his son George H. as his executors.

We learn from this will that Dr. Keerl had accumulated what was a large fortune for his times, and it seems to have been due entirely to his industry, good judgment and business capacity.

STUDIES IN TYPHOID FEVER.

SERIES I-II-III.

The papers on Typhoid Fever, edited by Professor William Osler, M. D., and printed in Volumes IV, V and VIII of the Johns Hopkins Hospital Reports, have been brought together and bound in cloth.

The volume includes thirty-five papers by Doctors Osler, Thayer, Hewetson, Blumer, Flexner, Reed, Parsons, Finney, Cushing, Lyon, Mitchell, Hamburger, Dobbin, Camac, Gwyn, Emerson and Young. It contains 776 pages, large octavo, with illustrations.

The price is $5.00 per copy. Address The Johns Hopkins Press, Baltimore, Maryland.

THE BACILLUS AEROGENES CAPSULATUS IN PUERPERAL INFECTION.

By Herbert M. Little, M. D.

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(From the Obstetrical Department of the Johns Hopkins Hospital and University.)

In 1897, Dobbin reported from this clinic the isolation of *B. aerogenes capsulatus* from a case of physometra, and suggested that this organism was the true etiological factor concerned in its production. This observation has since been abundantly confirmed by other investigators, though the rôle of the gas bacillus as an infecting agent has received much more attention from pathologists than from obstetricians.

Apart from Dobbin's original case and one which he observed subsequently, no one in America or England has recorded the isolation of this bacillus during the course of puerperal fever. Such observations, however, have been made both in France and Germany, and as in both countries the organism is described under varying names, it may be well to consider briefly the various bacteria which have been described as original but which are nevertheless undoubtedly identical with the bacillus of Welch and Nuttall.

B. aerogenes capsulatus (Bacterium Welchii, Migula, 1900), better known in America as the "gas bacillus," was first described by Welch and Nuttall in 1892. Dr. Welch has briefly given its characteristics as follows: "A rather coarse, non-motile, anaerobic bacillus; stains by Gram; grows on all of the ordinary culture media under anaerobic conditions, best at body temperature but also at room temperature; liquefies gelatine slowly; forms spores constantly according to the race and culture medium; and is capable of generating gas, not only by fermentation of sugars but also from proteids."

Capsules are usually readily demonstrable with the usual stains, particularly when the bacilli are grown in milk or obtained directly from the tissues of an inoculated animal.

Milk is probably the most satisfactory culture medium as the reaction is very striking. The milk becomes acidified and coagulated, then partially digested, giving a "worm-eaten" appearance to the clot. For absolute identification, this reaction may be supplemented by the other characteristic test suggested by Welch; namely, the production of gas in the tissues of a rabbit killed within a few moments after the injection of an emulsion of the organism into its ear vein. This last test, which Dr. Welch considers the most important of all for the identification of the bacillus, we have applied in every instance with positive results, and we were also able to obtain the organism from the heart's blood of the animal.

The Vibrion Septique.—This organism, or complex of organisms, was discovered by Pasteur in a class of puerperal cases which appeared to him to have a peculiarly fatal course. Unfortunately, he was never able to cultivate it alone, but of recent years it has been generally believed that the bacillus of malignant œdema, isolated by Koch, represents it in pure culture. There is, however, reasonable ground for doubting whether this view is really correct, since Pasteur's vibrion was frequently present in cases of puerperal infection and was widely distributed in nature, being invariably present in the intestinal canal and in cases of putrid gangrene. It was motile in the absence of oxygen but lost its power of motion when exposed to the air. The bacillus of malignant œdema, on the other hand, is far less widely distributed, is rarely isolated from the human intestine, and, so far as I have been able to ascertain, plays a very limited part in the production of puerperal infection. Moreover, it differs from the gas bacillus in being motile and decolorizing when stained by Gram's method; but this latter test was unknown to Pasteur. In short, *B. aerogenes capsulatus* seems to conform very closely to the description of the vibrion septique, and the isolation of an identical organism from a large number of cases of criminal abortion—the only class of cases now exposed to the same danger of infection as all cases in Pasteur's time—renders it highly probable that the organism in question represented an impure culture of the gas bacillus.

In 1880, Doleris, who was a pupil of Pasteur, divided the bacteria giving rise to puerperal fever, into micrococci and "Bactéries Cylindriques Septiques,"—the latter a new name for the vibrion septique. Eighteen years later, in reporting the autopsy findings in a case of infection following the removal of the placenta by a midwife, he noted that the body was distended with gas and that three organisms were present, streptococcus and colon bacillus, which were obtained in pure culture, and also the *vibrion septique,* which he could not isolate.

Menereul, likewise, reported a case of crepitating gangrene which he ascribed to infection with the vibrion septique, although the results of his cultures and inoculations make it reasonably certain that he had to deal with the gas bacillus. Indeed, a study of the French literature upon the subject, from 1880 until the present time, gives a practically unbroken chain of evidence in favor of the identity of Pasteur's organism and *B. aerogenes capsulatus.*

Bacillus Phlegmones Emphysematosæ.—In 1893, Fraenkel described as the cause of gaseous phlegmons, the organism to which he gave the above name. The same year Ernst isolated a similar organism at an autopsy upon a case of infected abortion, but both bacteria were believed to differ in some degree from the original gas bacillus. Goebel in 1895 insisted upon the identity of the three; and although as far back as 1899 Fraenkel admitted this to be true, his organism is the only one widely known in Germany.

Bacillus Perfringens.—This bacillus was isolated from cases of otitis, mastoiditis, pulmonary gangrene, appendicitis, Bartholinitis and pelvic abscess, and was described by Veillon and Zubert in 1897. One year later the same investigators admitted that it was identical with Fraenkel's bacillus, but in France, it nevertheless retains the name given by them.

Bacillus Emphysematis Vaginæ.—Lindenthal in 1897 described this organism as the cause of gas cysts of the vagina and isolated it in two of six cases examined during pregnancy. In 1899, working with Hitschmann, he admitted its identity with *B. aerogenes capsulatus* as well as with Fraenkel's bacillus. His original communication is of interest as an evidence of the peculiar distribution of the gas bacillus.

The Granulobacillus Saccharobutyricus Immobilis Liquefaciens.—This bacterium was isolated by Schattenfroh and Grassberger from a great many samples of milk, ground water, etc.; and there would appear to be but little doubt as to its identity with the various bacilli noted above.

Bacillus Aerogenes Aerophilis Agilis.—In 1902, Uffenheimer isolated this bacillus at an autopsy upon a case of puerperal infection; and his note, "Exemplare ihre Beweglichkeit verloren," together with the admitted mixed character of the infection, would, apart from some imperfections of his technique, as pointed out by Westenhoffer, suggest that he was dealing with an impure culture of the gas bacillus.

Only one other organism is perhaps worthy of mention in this connection—the *B. septique aerobie* of Legros and Lecène. This seems to be identical with what Dr. Welch calls the aerobic form of the gas bacillus, and is practically interesting from the fact that it was so named to accentuate its points of similarity with, and dissimilarity from, the vibrion septique.

The cultural characteristics and pathological properties of *B. aerogenes capsulatus* are well known; but many are not aware of the extent of its distribution. It has been found regularly in the fæces of human beings, as well as of dogs, cats, and swine, also in those of rabbits, rats, guinea-pigs, mice, chickens, and cows, and likewise in the excreta of flies found hovering about dead bodies. It is frequently found in garden earth, but rarely in street dust; occasionally it may be isolated from the dust of hospital wards and from scrapings of the human skin. Its presence in the uterus in cases of infection is not surprising.

According to Dr. Welch its introduction into the pregnant or puerperal uterus may give rise to one or more of the following conditions:

I. Emphysema of the fœtus.
II. Puerperal endometritis.
III. Physometra.
IV. Emphysema of uterine wall.
V. Gas sepsis.

Being chiefly concerned, in this article, with puerperal endometritis, we shall slightly alter this order and consider the second subdivision last.

Emphysema of the Fœtus.—Knowledge of the pathology of the condition dates from Dobbin's observations in 1897. In his case, infection of the fœtus occurred by way of the placental circulation. Krönig and Menge have shown that the liquor amnii may become infected prior to the rupture of the membranes (l. c., p. 90), and in three cases reported by them (p. 167) the infection of the fœtus was undoubtedly due to the swallowing of infected amniotic fluid.

Physometra or Tympania Uteri.—Formerly it was held that this condition could be produced by the aspiration of ordinary air into the uterus, but it is now universally recognized as being bacterial in origin. Gebhard in 1893 analyzed six cases and found in all a bacillus which he identified as Bacillus coli. In four cases it occurred in pure culture, while in two others it was associated with the streptococcus.

Chiari, Hitschmann, and Lindenthal have shown that Bacillus coli is capable of producing gas only in the tissues of diabetics. Moreover, the clinical and experimental work of the latter observers, supplemented by that of Halban, has shown that even this is very exceptional, and has served to confirm Dobbin's suggestion that the gas bacillus is the usual cause.

Emphysema of the uterine wall is usually associated with tympania uteri and has a like causation. It is of interest, as the condition frequently found at autopsies on cases dying as a result of puerperal infection, and was the lesion present in the case from which Ernst's bacillus was obtained.

Gas sepsis is probably the most important of the five subdivisions. Though cases showing evidence of general infection with the gas bacillus are not infrequently seen at autopsy, it is often difficult to decide whether the infection occurred during life or postmortem. Thus, in thirteen cases collected by Dr. Welch the evidence of ante-mortem invasion of the tissues seemed conclusive in but seven, including those of Dobbin, Ernst, Halban, and Krönig and Menge above referred to, and two others reported by Wood, and Graham, Steward and Baldwin, respectively. In none of these cases was the bacillus isolated from the blood during life; and but five cases have been reported in which this has been accomplished, all of which terminated fatally. Thus, Gwynn repeatedly cultivated the bacillus from the blood in a case of chorea, and Cole, and Norris from cases of infection following trauma; while the two remaining instances occurred in connection with puerperal infection, and are recorded by Fraenkel and Lenharz. Fraenkel's case was reported with practically no detail, while in Lenharz's the patient died from a general infection following an abortion at the second month. The vagina had been tamponed. There were marked pyrexia, jaundice, and air-hunger; later the patient became irrational. At autopsy, gas was present in the heart, and bacilli were found in sections from all the organs. There was no note of general emphysema.

In Case 9, which is reported in detail in the latter part of this article, the infection of the rabbit, the presence of bacilli in the smear preparations, and the distribution of the organisms in the microscopical sections of the tissues, leave little

or no room for doubt that the bacillus was present in the blood some days prior to death.

Puerperal endometritis is second in importance only to gas sepsis, and must be considered as a possible forerunner of that condition. Apart from cases ascribed to *Bacillus perfringens* by Mouchotte and Jeannin, no examples of such infection have been reported since Dobbin's paper.

Mouchotte, examining the uterine lochia from eighteen cases of abortion occurring between the second and the fifth months, isolated *Bacillus perfringens* in thirteen cases or 72%. In no instance was it present alone, being usually associated with streptococci, staphylococci, or *Bacillus coli*. Three of the thirteen patients died and one came to autopsy, at which there was no note of the presence of gas in the organs. Jeannin, likewise, made cultures from the fœtal surface of the placenta in five cases of delayed labor and obtained *Bacillus perfringens* in four. In his cases there was high fever (103°-104° F.) lasting from four to eleven days after delivery. The same observer has recorded the bacteriological findings in twenty-one cases of puerperal infection, *Bacillus coli* being noted in eighteen and *Bacillus perfringens* in twelve (57%).

The clinical character of the latter group of cases is interesting. In four, premature rupture of the membranes occurred, and in six, portions of the placenta or membranes were retained after delivery. The fever was noted as early as the first and as late as the eighth day, and invariably reached 103°-104°. Two cases died on the twenty-fifth and the forty-fifth days, respectively. There was no note of the condition found at autopsy.

In addition, Jeannin examined eighteen cases of incomplete abortion with subsequent infection, and isolated *Bacillus perfringens* twelve times. Streptococci were equally frequent and the *Bacillus coli* was present in fifteen cases. Two of the patients died, but there was no autopsy. Clinically, this group of cases is also of interest. In one instance there was no fever; in three the temperature dropped from 104° to normal immediately after cleaning out the uterus; while in two others a sudden drop to normal was noted after slight preliminary rise, and none of the six had fever subsequently. A seventh case had a slight temperature on the second day, and two other rises on the fourth and sixth days, respectively; though the cultures taken with these rises suggest infection at the time of operation. Thus, in all his cases, the tendency was for the fever to fall abruptly upon cleansing the uterus. Jeannin has also reported three cases of physometra in which *Bacillus perfringens* was isolated. Two of these cases died and came to autopsy but there is no note of general infection, nor of the presence of gas in the tissues.

Finally, Rist and Mouchotte reported three cases of infection following abortion, in two of which they were able to obtain *Bacillus perfringens* from the uterine cavity. Streptococci and staphylococci were also present, and, in one instance, other anaerobes. The fever was alarmingly high in both cases, but recovery followed in each. These observers suggest the identity of *Bacillus perfringens* with Fraenkel's bacillus and the vibrion septique.

Our experience with the gas bacillus comprises some fifteen cases in the Obstetrical Department of the Johns Hopkins Hospital, in only ten of which was the bacillus identified with absolute certainty. These, including Dobbin's two cases, are given in detail below.

Bacillus aerogenes capsulatus may gain access to the uterine cavity in one of two ways. The first, and by far the more usual, is its introduction by means of the examining finger or by instruments. By reason of its almost invariable presence in the fæces of human beings, this is particularly liable to occur in spontaneous labor when the perineal and vulvar regions are insufficiently cleansed, as well as in operative cases even in spite of this care. In the second place, the organisms may occasionally be present in the circulating blood, by which they are carried to the uterus, and then be cultivated from the lochial discharge. It is noteworthy in this connection, that in both of our cases which terminated fatally, intestinal ulcers were found at autopsy.

The passage of the gas bacillus into the circulation by way of typhoid ulcers is not merely a hypothetical supposition, as Hitschmann and Lindenthal have reported the case of a boy, æt. 8, in whom a general infection could apparently be traced directly to such lesions.

The presence of bacteria similar to or identical with *B. aerogenes capsulatus* has not as yet been noted by any of the investigators of the organisms present in the normal vagina, and the two cases in which they were found by Lindenthal in gas cysts must be considered quite exceptional.

It is worthy of note, that of our ten cases of infection, seven followed operative procedures, and an eighth, a self-induced abortion. All of these had been repeatedly examined. In one case, however, which entered the hospital profoundly infected, the patient stated that she had not been examined vaginally. The organisms cultivated from this patient were obligate anaerobes, and this was one of the cases in which intestinal ulcers were found at autopsy.

Once within the uterus, the character of the reaction produced will probably vary with the facilities for growth and development afforded by circumstances. Krönig has stated that anaerobes cannot develop in the uterus in the presence of oxygen, and it would seem that the anaerobic growth is favored by such procedures as packing the vagina. In cases where the infection is mixed, it is doubtful whether free drainage would preclude the growth of anaerobes; since, as Kedrowski has shown, aerobes in their development not only absorb a certain amount of oxygen, but also give off some substance favoring the growth of anaerobes. We, ourselves, have noted that, even with free access of air, the gas bacillus developed fairly profusely in milk when associated with the staphylococcus aureus.

Symbiosis, moreover, would not only appear to favor the growth, but also to enhance the virulence of the organism. Thus, Achalme, as early as 1880, increased the virulence of streptococci by associating anaerobes with them. Roger, Novy

and Penzo have also shown that the association of *B. proteus* or *B. prodigiosus* will markedly increase the virulence of the bacillus of malignant œdema; while Besson has noted the same in reference to the vibrion septique. The last-named observer even goes so far as to say that the vibrion septique is harmless in healthy tissues unless in association with other bacteria.

On the other hand, the work of Dr. Welch, confirmed by Fraenkel, and more recently by Kamen, leaves no doubt as to the ability of the gas bacillus to induce by itself a typical inflammatory reaction; but it is interesting to note that in only two of our cases (one of which was a case of mastitis) was the organism found alone. In a third case (B. L., Case 7), the cultures take after the febrile rise showed only the gas bacillus, but a previous culture had shown in addition the presence of streptococci.

It is the custom in the Obstetrical Department of the Johns Hopkins Hospital to examine the uterine contents bacteriologically in every case in which the temperature reaches 102° during the puerperium, and to take cultures after the conclusion of the third stage of labor whenever the patient enters with a temperature, or has been subjected to attempts at delivery by persons not connected with the department. Likewise in all cases of incomplete abortion, especially if of a criminal character, cultures are taken before the patient is examined vaginally.

In every instance 2-4 cc. of the uterine contents are secured by means of a lochial tube, and from this inoculations are made upon various culture media,—plain agar, hydrocele agar, blood serum, milk, and bouillon. Routine anaerobic inoculations are made by mixing the lochia with glucose agar which has been freshly sterilized or boiled, then cooled rapidly to 40°. After inoculation, the agar is allowed to solidify and its free surface is then covered with a layer of paraffin or agar. In the majority of cases, however, two sets of tubes are inoculated, one of which is incubated in an atmosphere of hydrogen.

Should the gas bacillus be present, there is usually no difficulty in recognizing it in coverslip preparations made directly from the uterine contents, particularly when stained by Gram's method. When associated with other organisms, its isolation in pure culture may offer some difficulty. Fraenkel suggested that this could be effected by killing off the other microorganisms, taking advantage of the fact that the bacillus in question offers considerable resistance to heat—Pasteurization. For this purpose the inoculated tubes are placed in a water bath and heated to 65° C. for three to five minutes, after which they are removed and cooled. It has been repeatedly demonstrated that the gas bacillus will survive this treatment, (according to Fraenkel it will withstand 70° C. for three minutes), while its more usual associates will for the most part be destroyed.

When the organism has been isolated in pure culture, we have, as noted above, invariably proven its identity by obtaining a characteristic reaction after its inoculation into a rabbit.

If for no other reason, the recognition of the presence of the gas bacillus is important in relation to that large group of cases known as "Sapræmia;" "to produce which," according to one American authority, "germs of putrefaction—saprophytes—must gain access to the uterus after labor." The diagnosis in this class of fevers is usually not based upon bacteriological examination, but merely upon the benign clinical course of the case, and the fallacy of this method is shown by the fact that Bumm was able to demonstrate streptococci in a number of cases presenting the supposedly characteristic clinical features. Moreover, the observations of Jeannin as well as the bacteriological findings in our cases (Cases 4 and 6) bear out the contention of Bumm and Williams, that no case should be diagnosed as Sapræmia without a bacteriological examination.

Doleris says that all organisms found in saprophytic infections have been found in the vagina. As *B. aerogenes capsulatus* is not an inhabitant of the vagina, and as it would appear neither advisable nor justifiable to classify it with the ordinary putrefactive bacteria, the possibility of its giving rise to autoinfection or Sapræmia is very remote. This being the case, it is probably always introduced from without, and just as in streptococcic infection, the physician should be held responsible for its introduction, unless satisfactory proof to the contrary can be adduced.

The ideal treatment in these cases of infection is, of course, prophylactic, and this can best be attained by careful aseptic technique during labor. In the Johns Hopkins Hospital the routine is as follows: A rectal enema is given during the first stage of labor, and the patient is prepared for vaginal examination by first clipping close the vulvar hair, then scrubbing with green soap and water, followed by sponging with 95% alcohol; finally, a towel soaked in a 1-2000 bichloride solution is applied, and left in position until the examination—a minimum of three minutes. In all operative cases the vulva and perineum are shaved and cleansed by the permanganate-oxalic-acid method in addition to the above. The hands are disinfected as for major operations. No douches of any kind are given. If no details of this technique are omitted, the results will be good. Unfortunately, in emergency cases it is often necessary to operate without the preliminary enema, and the introduction of the hand during operations such as version may unavoidably carry up intestinal bacteria into the vagina and uterus. But even if this occurs the bacteria may cause no trouble, provided the third stage be carefully conducted and no portions of the placenta or membranes be retained.

Should fever ensue, the first requisite is an accurate diagnosis. This is important more from the standpoint of prognosis than of treatment, as the latter, no matter what the infecting agent, will, in general, be along three lines: (1) removal of necrotic material offering a medium for growth of organisms, (2) establishment of free drainage from

the uterus, and (3) stimulation of the natural resistance of the patient. The finger should be used in removing débris, as the curette, however carefully manipulated, will undoubtedly interfere with the attempt at local reaction on the part of maternal tissues and may open up sinuses and dislodge thrombi. A large douche (4 liters) of hot salt solution (110° F.) will also aid in cleansing the cavity. So-called antiseptic douches will accomplish little that the salt solution will not, while the danger of poisoning from absorption should not be overlooked. If the cervix is sufficiently patulous to admit two fingers, as good drainage will be obtained by leaving it alone as by introducing gauze. To aid resistance, the patients are well fed and when necessary strychnia and alcohol are given; but the greatest emphasis is placed on the necessity for large quantities of fluids either taken by mouth or injected into the rectum.

The greatest danger to be feared is the passage of the organisms from the uterus into the circulating blood. While patients with streptococcus septicæmia not infrequently recover, all known instances of gas sepsis have ended fatally. If the infection be grave and definitely localized in the uterus, hysterectomy is justifiable, but theoretically, only when the infection is on the point of becoming generalized. The difficulty in establishing this definite moment is obvious, and the operation, as in our Case 9, may completely fail in accomplishing its purpose.

Following is a synopsis of the cases in which we have demonstrated the presence of the gas bacillus. Two of them had been noted previously in the articles of Drs. Welch and Dobbin, but are here incorporated for the sake of completeness.

It is not contended, nor is it intended to imply that *B. aerogenes capsulatus* was, in each instance, the determining factor in the causation of the fever. The varying effects of such infection have been shown above, and even when typical gas production is absent, the possibility of the organism in question in influencing the virulence of others with which it may be associated, must be continually borne in mind.

Case I.—*Generally contracted pelvis; dystocia; frequent examinations by midwife; gas noted in vaginal discharge; basiotripsy; death.*

P. A., (O. O. S. No. 56.) (Dobbin's first case.)

"A Bohemian woman with a generally contracted pelvis had been in labor some three to four days under the care of a midwife. When she came into our hands, the head of a macerated child was found firmly engaged in the superior strait, the uterus being in a state of tetanic contraction. A fœtid, dark-colored discharge, which contained many gas bubbles, was escaping from the vagina with a crackling sound. Delivery was effected by means of Tarnier's basiotribe. The mother was profoundly infected and died next day. Within a few hours after death her body had nearly doubled its original size, as a result of development of gas in the subcutaneous tissues. Similar changes were observed in the fœtus and placenta, and we were able to demonstrate the presence of the gas bacillus in the tissues of both, as well as in the uterine lochia. No autopsy was allowed."

Case II.—*Generally contracted rachitic pelvis; dystocia; frequent examinations and attempts to deliver; rise of temperature during labor; prolapse of cord; perforation and extraction of child; recovery.*

M S., (H. No. 316.) 1-para, white, was admitted to the hospital in labor. An outside physician had made several vaginal examinations and had attempted delivery with forceps. The following are extracts from the note on admission:—"Small, slightly-built woman, facies expressive of suffering, pinched and drawn; superficial examination suggests rachitis; breasts large, nipples prominent, colostrum; heart and lungs negative; abdomen enlarged to size of full term pregnancy, fundus two fingers' breadth below ensiform; there is no contraction ring, though the uterus is apparently tetanically contracted; the round ligaments converge upwards. An accurate diagnosis of the presentation and position is impossible, though the occiput is directed downward and to the left side. No fœtal heart heard. The pelvic measurements are Sp. 23.5, Cr. 23.5, Tr. 28, D. B. 16.5 cm."

The results of vaginal examination were as follows: "Marked œdema of soft parts; forceps abrasions; cervix fully dilated, cord prolapsed, not pulsating. The head is movable at the superior strait in L. O. I. T., the sagittal suture being only about 1.5 cm. from the symphysis pubis; there is a marked caput succedaneum. The diagonal conjugate measures 9.5 cm. and the antero-posterior and transverse diameters of the outlet are 8 cm. and 7.5 cm., respectively. At this time, the patient's temperature was 101°, her pulse 108 and her respiration 22 per minute."

The head was perforated and the child extracted with the cranioclast. It was 46 cm. long and weighed 1850 gms. without the brain. There were no macroscopic evidences of infection, but a uterine culture was taken immediately after the completion of the third stage of labor. The day after delivery the patient's temperature reached 103°, and the following day a second culture was taken and a douche given. The fever persisted for seven days but the woman left the hospital in excellent condition.

Bacteriological Report, M. S., Fever Case 64.

Culture I.

Smears show a few cocci and a number of large bacilli with rounded ends.

Cultures show:—*Streptococcus pyogenes, Staphylococcus albus.*

Culture II.

Smears show bacilli similar to those previously seen. Capsules can be demonstrated.

Cultures show:—*Streptococcus pyogenes, Staphylococcus albus, Bacillus coli, Bacillus aerogenes capsulatus.*

Case III.—*Generally contracted pelvis; dystocia; frequent vaginal examinations; rise of temperature during labor; craniotomy; recovery.*

A. T., (O. O. S. No. 762), a black primipara, was seen in consultation outside the hospital. She had been in labor for two days and had been repeatedly examined. She was dull and listless. Temperature 101°, pulse 120. Her uterus was tetanically contracted upon a large child; no fœtal heart heard. The pelvis measured Sp. 22.5, Cr. 24, Tr. 28, D. B. 18. Vaginal examination: Outlet relaxed, vagina hot and dry, cervix fully dilated, membranes ruptured; head at brim, in L. O. I. A., not engaged; diagonal conjugate 10 cm. A marked caput succedaneum had formed and palpation of this elicited gaseous crepitation. The forceps was applied ineffectually and craniotomy was resorted to, the placenta being subsequently removed manually. Cultures were made from the liquor amnii, and from the lochia on the first day of the puerperium.

At autopsy upon the child there was abundant evidence of general infection with the gas bacillus.

Bacteriological Report, A. T., Fever Case 102.

Source of cultures:—(a) Liquor amnii, (b) Uterine lochia.

Smears show micrococci and bacilli.

Cultures show:—*Streptococcus pyogenes, Bacillus coli, B. aerogenes capsulatus.*

This patient's temperature chart is unusual in that but slight rises in temperature are noted, in no instance above 100°. This may possibly be explained by the fact that the temperature was taken but twice daily, and at irregular intervals.

CASE IV.—*Inevitable abortion; vaginal pack; marked rise in temperature subsequent to labor. Sapræmia (?).*

M. W., (H. No. 1145), a white multipara, entered the hospital April 10, 1902, with a history of irregular bleeding for two weeks, which became alarmingly free two days previous to entry. She had menstruated last October 21, 1901.

The fundus uteri was one finger's breadth above the umbilicus, the child lying in L. S. I. A. No fœtal heart heard. Temporizing measures were employed, but the bleeding continued, and as there was no evidence of life on the part of the fœtus, it was decided to induce labor. The vagina was accordingly packed with sterile gauze which stimulated the uterus to contract, and at 5 a. m., April 12, the patient spontaneously expelled a dead fœtus (6 mos.). The same day about 6 p. m., subsequent to the expulsion of some large clots covered with decidua, the temperature rose to 103°, and the pulse to 108. There were no subjective symptoms and the temperature became normal within 48 hours.

Bacteriological Report, M. W., Fever Case 184.

Source of cultures:—*Uterine lochia.*

Smears show coarse bacilli staining by Gram's method.

Cultures show:—*B. aerogenes capsulatus.*

CASE V.—*Precipitate labor; hæmorrhage; collapse; submammary infusion; mastitis.*

E. W., (O. O. S. No. 619), a white primipara, had a precipitate labor resulting in a bad perineal laceration. The placenta was retained, but as it was desired to repair the perineal tear at once, Crede's method of expression was employed. The patient subsequently collapsed, and was infused with 2000 cc. of sterilized normal salt solution prepared from tap water. The following day her temperature rose to 102°, but almost immediately fell to normal. On the fifth day it again rose, reaching 103.4°, with evidence of local inflammation in one breast. This was incised and drained, after which the puerperium was uneventful.

Bacteriological Report, E. W., Fever Case 84.

Source of Culture:—Pus from breast abscess.

Smears } show *B. aerogenes capsulatus.*
Cultures }

This case has been included with a view of showing the great danger of infection in all procedures such as douches and irrigations where the asepsis is not absolute, and as evidence of the fact recently insisted upon by Kamen, that the gas bacillus may operate alone in producing local inflammation, particularly if superimposed upon an injury.

CASE VI.—*Normal pelvis and pregnancy; self-induced abortion; infection; removal of infected ovum; recovery.*

O. H., (H. No. 1738), a white multipara, was admitted to the hospital March 30, 1904. She had menstruated last in December, 1903, and one week previous to admission (i. e., March 22, 1904), knowing herself to be pregnant, had introduced a bougie into her cervix for the purpose of inducing an abortion. This was attended by slight bleeding, which persisted until entry into the hospital. The night prior to her admission (March 29) she had had a slight chill and vomited a good deal. The day of admission she had five slight chills, and entered with a temperature of 102.7° and a pulse of 136.

From external examination little could be made out except slight tenderness above the symphysis pubis, but as there was a foul-smelling discharge from the vagina, preparations were made to remove the infected ovum. The patient was anæsthetized and prepared for operation in the usual manner. A culture was taken from thhe uterine cavity, after which the cervix was dilated to admit the finger. A considerable amount of foul-smelling tissue was removed, and the uterine cavity was thoroughly washed out with normal salt solution. Within twelve hours the temperature fell to normal, where it remained till the 13th day, when it rose following a vaginal examination, but fell to normal again almost immediately.

The tissue removed from the uterus was preserved and examined microscopically.

O. H., Current work No. 689. Microscopic examination.

The specimen apparently consists of the entire ovum. The amnion and chorionic membrane are completely necrotic, as well as the villi immediately surrounding the latter. The decidua is well-marked, and shows but slight development of Nitabuch's layer; between it and the amnion are chorionic villi in all stages of degeneration, some perfectly normal, others completely degenerate. There are no blood-vessels; most of the intervillous spaces are filled with blood, though here and there it is distinctly coagulated. Sections stained by the Gram-Weigert method show myriads of thick bacilli of varying lengths, and also cocci. Diagnosis: Infected abortion.

Bacteriological Report, O. H., Case 249.

Source of Culture:—Uterine cavity before operation.

Smears show chiefly large coarse bacilli, often in pairs and frequently intracellular. They retain Gram's stain.

Culture shows:—*Micrococcus aureus, Micrococcus albus, B. aerogenes capsulatus.*

It is noteworthy that in addition to its development in all the cultures grown anaerobically, the gas bacillus was also demonstrable in the milk grown aerobically probably owing to its association with staphylococci.

CASE VII.—*Normal pelvis and pregnancy; prolonged labor; dystocia; Champetier de Ribes Balloon; version and extraction; post partum hæmorrhage; vaginal pack; puerperal infection: recovery.*

B. L., H. No. 1597, a white multipara æt. 41, was admitted to the hospital on October 31, 1903. She had been pregnant ten times before, five of her children being still-born and three others living for only a few minutes after birth. One child had presented by the breech, but apart from this and one forceps operation, her labors had been normal. She invariably lost much blood after the labor, particularly after the last, when "the after-birth came before the child." Following this confinement she was in bed four weeks with fever, and since that time menstruation has been painful. Last menstruation February 15, 1903. Examination showed the presence of a cystic goitre, a rapid pulse, and slight œdema of the lower limbs; apart from this her condition was normal.

Pains began 10 p. m., November 29, but in spite of the fact that they became hard and frequent, the cervix failed to dilate. On December 2, at 8.30 p. m., a Champetier de Ribes bag was introduced into the cervix, and was expelled four hours later, when the cervix was found three-fourths dilated. During the night the patient's temperature rose to 101.6°, but almost immediately fell to normal. After the expulsion of the bag the pains gradually ceased and the patient slept till morning, when, in the complete absence of pains, it was decided to complete the dilatation of the cervix manually and deliver the child by version. The version was readily accomplished, but owing to the large size of the child's head, great difficulty was experienced in extraction, and though the fœtal heart continued to beat for several minutes after delivery, the child could not be resuscitated.

The patient lost 1000 cc. of blood during the third stage, and examination showed a slight perineal tear and also a bilateral laceration of the cervix. The former was repaired immediately,

but as the uterus contracted firmly after the expulsion of the placenta and the bleeding abated, suturing the cervix was considered inadvisable. A uterine culture was taken immediately after the third stage. Four hours after the completion of the operation the bleeding still continued and as it was evidently from the cervix, it was thought that it might be controlled by a vaginal pack, which was accordingly carefully introduced. The patient's pulse had risen to 156 per minute, but following the introduction of the pack and the administration of stimulants, marked improvement occurred. The pack was removed some eighteen hours later (9 a. m., December 4).

On the morning of the third day (the day following the removal of the pack), a second uterine culture was taken. The cervix was far back, its lumen practically occluded. When its anterior lip was drawn forward with a tenaculum, a large amount of foul-smelling brown fluid escaped from the uterus, but there was no evidence of the presence of gas. Following the culture, the temperature rose to 101.4° but fell again to normal, rising to 104° the next day at 4 p. m., falling during the night to 97°, but reaching 103.6° at 8 a. m. With both these rises there were chills, but the patient's general condition remained good and the physical examination was negative save that the fundus uteri was soft and high, and the lochia rather foul.

The day of the first rise (4th day) the hæmoglobin was 45%; the leucocyte count, 20,200.

After the second rise (5th day, 8 a. m.) a third uterine culture was taken and a douche of 2 litres of salt solution was given. A blood culture was also taken.

The fever continued till the 9th day, varying from 100° to 103°, but the patient gradually improved, and left the hospital the 22d day in excellent condition.

Bacteriological Report, B. L., Fever Case 235.

Source of culture:—Uterine lochia.

(a) Immediately after labor.

Smears, negative.

Cultures, negative.

(b) Morning of third day.

Smears show numerous thick bacilli with rounded ends, stained by Gram's method; no cocci seen.

Cultures show:—*Streptococcus pyogenes, B. aerogenes capsulatus.*

(c) Morning of 5th day.

Smears show as in "(b)."

Cultures:—*Aerobic, negative. Anaerobic, B. aerogenes capsulatus.* Blood culture, 5th day, negative.

The streptococci were evidently few in number, and accordingly narrowly escaped being overlooked. Low has pointed out that in large numbers of cases where colon bacilli alone are demonstrable, the primary invader is the streptococcus, which later outgrown, cannot be obtained in cultures.

Case VIII.—*Incomplete abortion; curettage; septicæmia with anaerobic organism; thrombosis; death.*

M. F., (H. No. 1702), a colored multipara, entered the hospital February 20, 1904. She had been perfectly well up to February 12, having menstruated last in November, 1903. On the day noted above she began to bleed, without any apparent cause, and during the night passed a mass of some sort per vaginam. Since then she had bled at irregular intervals. She denied any internal examinations or manipulations. She was a sparely-built colored woman, eyes sunken, mucous membranes pale, tongue coated, temperature 102.7°, pulse 130, respiration 30. No other abnormality was noted on physical examination. She was prepared for operation in the usual manner and a uterine culture was taken before an internal examination was made. The uterus was then curetted and douched with a large quantity of salt solution. After the operation the temperature rose to 104.3° and remained above 101.7° till the morning of the third day, when it became subnormal, rapidly rising again to 106°. This same day thrombosis of the left saphenous vein was noted, though there was practically no œdema of the extremity. The leucocyte count was 28,000. From this time on, the temperature remained persistently elevated, frequently reaching 105° and occasionally 107°.

Blood cultures taken on the 8th and 11th days were positive, as well as a urine culture the 15th day. Jaundice was noted on the 6th day, but never became marked. Patient died the 18th day.

Anatomical diagnosis, M. F., Autopsy 2260: "Abortion, clean uterine cavity; thrombosis of vena cava, left common iliac, femoral and saphenous veins, partial thrombosis of right iliac vein. Embolic abscesses in the lung. Cloudy swelling of liver and kidney. General anæmia. Hæmorrhagic ulcers of rectum. Acute splenic tumor. Infarct of spleen. Jaundice. Oidio-mycosis of œsophagus. No formation of gas in the organs.

Examination of material removed from the uterus by curettage 11 days post abortum. (Current work No. 677.)

"The stroma is much denser than usual, and is infiltrated with round cells and a few leucocytes. Scattered through the tissue are a few areas which stain brightly with eosin, some of which are apparently fibrinous in character, while in others distinct remnants of decidual cells can be found. Examination with the high power shows at the margins of portions of the endometrium, but particularly in the blood surrounding, numerous cocci, and occasionally large thick bacilli. The cocci are usually in groups, but short chains are also to be seen. The bacilli occur in an isolated manner and in no case can more than two be found in the same field."

Bacteriological Report, M. F., Fever Case 239.

A. Source of culture:—Uterine cavity.

Smears show micrococci in chains, also coarse bacilli, occasionally in chains. Both forms retain Gram's stain. The bacilli are occasionally seen within leucocytes.

Culture:—Aerobic plates and tubes absolutely negative. Anaerobic tubes show:—(I) *B. aerogenes capsulatus*, (II) a streptococcus.

B. Blood.

Source of culture:—Blood from med.-basilic vein.

Culture I, made on the 8th day.

Ten tubes of various forms of agar were inoculated for the purpose of making plate cultures, but as by accident there were but 9 plates, 9 tubes were poured, and in one the agar was allowed to solidify. After incubation there was absolutely no growth on any of the plates but in the bottom of the solid tube, several colonies were seen. These proved to be a micrococcus growing in chains and similar to the one isolated from the uterus.

Blood culture No. II, made on 11th day.

Bearing in mind the previous result, ten tubes were inoculated as before and when pouring them into Petri dishes, about 2 cc. of the medium was retained in the tubes, which were rolled and cooled in the manner described by Esmarch. Five plates and the same number of tubes, selected indiscriminately, were incubated in the usual manner, and the others, in an atmosphere of hydrogen. None of the former showed any growth after 5 days, while numerous colonies developed upon those incubated anaerobically. These consisted of micrococci growing in chains, apparently identical with those previously obtained.

C. Urine.

Source of culture:—Catheterized urine.

No. I:—Made on the 15th day (contaminated).

No. II:—Second culture obtained within five minutes after death of patient showed in all media streptococci and an unidentified bacillus. The cocci were noted in both aerobic and anaerobic

tubes, possibly developing in the former as a result of the symbiosis.

In all instances the organism was apparently identical with that first obtained from the uterine cavity, and had the following characteristics: Micrococcus, invariably paired, more frequently in chains of ten to twelve elements. Retains Gram's stain (1.2.5 min.). Grown on agar mixed with blood frequently shows a distinct hæmolytic ring. Capsules not demonstrated. No spores, no motility.

Anaerobic growth was as follows:

Milk.—Acidity, no coagulation.

Glucose-bouillon.—Slight sediment.

Glucose-agar.—Fine pin-point raised pale gray colonies.

Blood serum.—Similar growth.

Hydrocele agar.—Similar growth, more profuse.

Transfers were made to various media in attempt to obtain aerobic growth. There was a slight growth on one hydrocele agar tube and one or two colonies on blood serum. The remaining tubes showed no growth and transfers could not be obtained from the two noted as positive.

At autopsy the same organism was obtained from the thrombus and by gradually reducing the percentage of hydrogen in which it was grown, aerobic cultures were finally obtained. These, however, died out in two or three days. The presence of a capsule was also suggested. So far as I am able to learn, this is the first instance recorded in which an anaerobic organism other than the gas bacillus has been obtained from the blood during life. The case is also of interest from the fact that in spite of the almost complete occlusion of the veins of the extremity there was practically no œdema and the swelling was only appreciated after more careful comparative measurements.

Case IX.—*Febricula during pregnancy; normal labor; puerperal fever. Isolation of Bacillus aerogenes capsulatus from the uterus; blood culture negative; hysterectomy; isolation of Bacillus aerogenes capsulatus* (?) *and Bacillus typhosus from the circulating blood; death; lesions of typhoid fever; gas bacilli and typhoid bacilli in cultures at autopsy, and in sections from organs.*

L. S., (H. No. 1597), æt. 19, black, 1-para, married. Was first seen in the dispensary January 9, 1903. Her previous pregnancy and labor had been normal and her condition at that time was excellent. The pelvis measured Sp. 24.5, Cr. 26, Troch. 30, D. B. 18, D. C. 11.75.

She was admitted to the hospital January 18. Her condition then, apart from pregnancy, was quite normal: Temperature 97.6°, pulse 92, respiration 24. On the third day following her admission (January 20) she complained of some headache, and had a temperature of 100.4°. For nine days the temperature ran an irregular course, elevated in the afternoon, normal in the morning, only once reaching 102°. In the afternoons, she occasionally complained of headache and pain in the back of the neck, but these invariably disappeared by the following morning. Typhoid fever was thought of, but there was complete absence of definite symptoms and physical signs; moreover, as she had a doubtful history of syphilitic infection, she was put upon antisyphilitic treatment and apparently improved under it, the fever gradually subsiding, so that she appeared perfectly well on January 30.

Labor pains began early in the morning of February 2, and she was delivered spontaneously at 5 p. m. The child and placenta were normal. On account of the fever before labor, a uterine culture was taken immediately after the completion of the third stage.

On February 4 (third day post partum) there was no visible growth in the tubes and a second culture was taken, in the smears from which, long chains of Gram-staining bacilli were found Two hours after this culture, the patient's temperature rose to 104°. A blood culture was taken on February 5, and on February 6 (fifth day) a third culture from the uterus, followed by a douche of salt solution. Part of the material obtained was inoculated into a rabbit which was shortly afterwards killed and incubated.

On February 7 (sixth day post partum) as the temperature was still markedly elevated, the rabbit having shown the definite lesions induced by Bacillus aerogenes capsulatus and the inoculations of various media with uterine lochia confirming this test, while no growth had occurred in the blood culture, supra-vaginal hysterectomy was done by Dr. Williams.

Following the operation the temperature fell almost immediately to 100.5°, but rose the following morning to 105.6° and ranged between 102° and 106° until death, 16 days later. The pulse was very rapid, never below 130 per minute, sometimes reaching 180. The patient was frequently irrational, and passed fæces and urine involuntarily; she could, however, answer intelligently till within 24 hours of her death. She complained of no pain, but towards the end dyspnœa became marked.

Treatment consisted in general stimulation with strychnia and digitalin, aided by infusions of large amounts of normal salt solution.

Clinical Bacteriology.

Uterine culture "A" at completion of labor, February 2.

Smears negative.

Aerobic and anaerobic inoculations upon various media.

Examination of same, four days later.

Aerobic cultures:—Negative.

Anaerobic cultures:—No growth in bouillon or milk; abundant growth of long, coarse bacilli retaining Gram's stain, in the condensation water of the blood serum tubes: Capsule stain positive, and spore-bearing forms seen. This organism inoculated into a rabbit produced lesions typical of those caused by Bacillus aerogenes capsulatus, the organism being cultivated from the heart's blood.

Uterine culture "B," third day after labor, February 4.

Smears showed Gram-staining thick bacilli, singly and in chains.

Aerobic and anaerobic inoculations:—Negative.

Uterine culture "C," fifth day after labor, February 6.

Smears show many thick bacilli. May occur singly and in chains, retain Gram's stain and resemble Bacillus aerogenes capsulatus.

Aerobic and anaerobic inoculations were made as before, and at the same time 2 cc. of the lochia was diluted with an equal volume of sterile bouillon and the mixture injected into the ear vein of a rabbit, which was killed five minutes later, and placed in the incubator for eight hours.

At autopsy typical gas bacillus lesions were present and the organisms were obtained on smears and cultures from the heart's blood.

Blood culture "A," February 4.

Aerobic and anaerobic inoculations negative after four days in thermostat.

Blood culture "B," February 10.

Owing to the poor quality of the circulation and the smallness of the superficial veins, only about 2 cc. of blood was obtained. The entire quantity was immediately injected into the ear vein of a rabbit, which was subsequently killed, and placed in incubator. The following morning the animal was markedly distended and Bacillus aerogenes capsulatus was obtained from its heart's blood in cover slip preparation and cultures.

On the advice of Dr. Welch, the above result was not considered absolutely conclusive, as the organism had not been grown in artificial media, and therefore the possibility of contamination from the intestine of the rabbit had to be considered.

Blood culture "C," February 15.

Blood obtained from right-median cephalic vein and a large number of inoculations made. At the same time 15 cc. of blood was collected under weak bichloride solution, but no gas bubbles were observed. Upon centrifugalization with weak acetic acid, a number of bacilli, similar to those previously described, were found in the sediment, as well as a few others, differing slightly in morphology.

After 48 hours there was no growth except in the milk, and in one hydrocele agar tube, the former appeared slightly acidified, while a few non-Gram-staining bacilli were found in the condensation water of the latter. The tubes were re-incubated anaerobically, but no change was noted.

February 23 secondary inoculations were made from the milk flasks and showed an aerobic bacillus, which by its cultural and agglutinative reaction was proved to be Bacillus typhosus.

At the autopsy upon the patient (No. 2252, February 23, 1904), Dr. Bunting made the following anatomical diagnosis:—Typhoid fever; operation (amputation of uterus), infected abdominal wound; œdema and atalectasis of lungs; cloudy swelling of liver and kidneys; œdema and swelling of the pancreas; multiple abscesses of the kidney; acute splenic tumor; early arteriosclerosis; healing ulcers in small intestine.

Bacteriological examination by Dr. W. W. Ford gave the following results:

Bacillus typhosus in heart, blood, and spleen.

Bacillus aerogenes capsulatus in abdominal wound, spleen, kidney, and ureteral abscess.

Micrococcus aureus in ureteral abscess.

Microscopic examination of heart, lungs, liver, pancreas, and spleen were without special interest, as far as our case is concerned. On the other hand bacteria were demonstrated in the kidneys, mesenteric lymph glands, intestine, and appendix, as follows:

Kidney.—Capsular surface is regular, convoluted tubules dilated; epithelium is low, granular, and ragged; the lumina show the granular precipitate of the so-called "colloid-droplets." A few hyaline casts are found. The glomeruli are congested, their capsular spaces dilated and show granular precipitates. The interstitial tissue is œdematous, but is apparently not increased in amount. In one portion of the section there are several distinct abscesses which show cellular detritus and pus cells, chiefly of the polymorphonuclear type. In the periphery of the abscess, however, there are mononuclear cells which are actively phagocytic for other nucleated elements. There are groups of *short, coarse bacilli, occurring in pairs, found in the abscess; also much coarser bacilli occurring chiefly at one focus.*

Mesenteric Lymph Glands.—Show the sinuses crowded with large mononuclear cells, many of which are phagocytic for lymphocytes. The glands also show œdema and scattered areas in which the cells are necrotic. There is apparently also hyperplasia of the lymphoid elements. The glands themselves and especially their capsules, with the intervening connective tissue, *show very many coarse, long bacilli, often in pairs or short chains.*

Intestine.—Peyer's patches show increase in the epithelioid elements and small mononuclear cells, with superficial necrosis, and also scattered areas of necrosis in the depth of the swollen patches. In these areas there is fragmentation of nuclei, degeneration of the cells and infiltration. The epithelioid cells are phagocytic.

The Appendix.—Shows in the lumen a necrotic slough. Necrosis also extends into the wall of the appendix to the muscularis at one point; the wall is here infiltrated with leucocytes. *In the slough are a few coarse bacilli, similar to those already described, also smaller bacilli.*

Examination of the puerperal uterus removed by supra-vaginal hysterectomy:—The organ weighs 515 grammes and measures 13 x 13 x 6.5 cm. Externally there is no abnormality. On opening its cavity, which measures 9 x 5.5 cm., a dark tenacious clot is disclosed 5 x 4 x 2 cm. On removing this, the placental site is found in the upper left quadrant of the posterior wall, it measuring 6 x 4.5 cm. and covered with black protruding thrombi.

Microscopic examination on the greater part of the clot consists of fibrin, though included in it here and there are areas of degenerated tissue containing spaces with apparently hyaline walls. Large numbers of bacilli are readily demonstrable, both in the fibrin and the degenerated tissue.

Sections from the placental site show internally a thick layer of fibrin with very few cells in its meshes. Between this and the muscularis is a thin layer of degenerated tissue, more or less infiltrated with blood, and richly supplied with blood-vessels, chiefly venous in character. Where the tissue is well preserved, it is made up of spindle-shaped cells with fusiform nuclei; scattered through it are large numbers of irregularly shaped cells with deeply staining nuclei. *There is no trace of inflammatory reaction.* Protruding into this tissue, but chiefly in the innermost layers of the muscularis, are numerous thrombosed vessels. The muscularis itself presents a normal appearance.

In some of the veins, but particularly in the necrotic tissue corresponding to the endometrium, *many large tolerably thick bacilli can be seen. These stain by Gram's method, but can be seen even in specimens stained with hæmatoxylin and eosin.*

Case No. X. *Rise in temperature during labor; manual dilatation of cervix and extraction of child; puerperal infection; parotitis; recovery.*

B. R., (O. O. S. No. 2170), æt. 25, 2 para. Pelvis normal. Was first seen by Out-patient Department, 8 p. m., April 20. At that time her cervix readily admitted two fingers, but at midnight, in spite of good pains, there was little further dilatation. Patient slept until morning. At 2 p. m., April 21, there had been little advance, but as the patient's temperature was 100.4°, her pulse 105, and the fœtal heart between 160 and 170 per minute, the cervix was dilated by Harris' method and the child extracted. The field of operation had been contaminated by fæces and a douche of hot normal salt solution was given after the completion of the labor. The temperature after labor was 100.6°, and the following day it rose to 102.2°. Its maximum, 103.5°, was reached on the fifth day; but from 103° on the sixth day, it fell to normal on the seventh day, and remained around 100° until the thirteenth day.

Swelling of the parotids was noted the day after operation, but was thought to be due to holding up of the lower jaw during the administration of the anæsthetic. Later, it was learned that a next-door neighbor had mumps, and that a member of the patient's family had had the same disease two weeks previously. A uterine culture was taken and a douche given on the third day, and on the fourth day a blood culture was taken.

While it is quite possible that the primary trouble may have been the parotitis, the presence of marked subinvolution of the uterus noted at examination on the tenth day, makes the bacteriological findings at least of interest.

Fever Records No. 241, B. R., O. O. S. No. 2170, April 23, 1904.

Smears show diplococci and two forms of bacilli, one short, the other large and coarse. All of the bacilli and some of the cocci retain Gram's stain.

Culture.—Gonococcus (I). Diplococcus retaining Gram's stain. Strepto-bacillus aerogenes capsulatus.

Blood cultures taken on the fourth day were negative.

Since the completion of the article two more cases have come under our observation.

I. R. S., H. No. 1886, æt. 41, white, married, aborted on August 17, 1904, when 3½ months pregnant. For seven days her condition was excellent, but on August 24 she had a severe hæmorrhage, to control which an outside physician packed the uterus with iodoform gauze. She was advised to enter the hospital, which she did on August 25.

On admission her temperature was 100° and her pulse 120. Large iodoform gauze packs were removed from the vagina and uterine cavity. A uterine culture was taken, some small fragments of the ovum removed with the finger, and a large douche of hot salt solution was given.

B. coli and *B. aerogenes capsulatus* were grown from the lochia thus obtained, but the patient made an uninterrupted recovery.

II. M. S., a white multipara, entered the hospital July 29, 1904, with a history of having had chills and fever during the day, accompanied by slight bleeding from the uterus. She denied having attempted to induce abortion, but her statement was later proven to be false.

On admission a purulent discharge was noted escaping from the cervix uteri. A uterine culture was taken and the infected ovum removed manually.

She developed pyæmia with panophthalmitis of the right eye and abscesses in the left arm, the abdominal wall, and in the left broad ligament. The eye was removed, the abscesses opened and drained, and the patient made a good recovery.

B. aerogenes capsulatus was associated with streptococci in the original culture, and streptococci were obtained from the patient's blood and from the pus in each of the abscesses.

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PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

January 16, 1904.

A Case of Arterio Venous Aneurism. DR. OSLER.

Dr. Osler showed a patient exhibiting this condition. The man—now 31 years of age—had, in his eleventh year, received a knife-wound just above the right knee. This was soon followed by swelling of the calf of the leg and a little later pulsation was noticed along the femoral artery with the development of a swelling in that region. The patient's health had remained good and he was exceptionally vigorous except for some disability in the right lower limb and for attacks of hemorrhage from varicose veins in the lower leg. Along the outer thigh reaching from the lower ribs to the foot, ran huge, tortuous varicose veins, and the whole right leg was enlarged. Thrombi were palpable in the veins, some of them organized and a few probably calcified. There was a pulsating swelling in Scarpa's space and along the femoral artery. Over this a thrill was felt most intensely about the middle of the thigh. In the abdomen was another pulsating tumor 8 inches across and occupying most of the hypogastrium and right iliac fossa. The pulsation here, too, was expansible in character and over it a thrill could be feebly felt. The abdominal tumor was thought by Dr. Osler to be a large venous sinus associated with the enormous venous dilatation above a traumatic arterio-venous aneurism. Its origin was, however, not perfectly clear, and, so far as he knew, there were no other cases like this one in the literature.

The Immunization of Mice to Cancer. DR. G. H. A. CLOWES.

Dr. Clowes made a preliminary report of recent work on this subject done by him at the Gratwick Laboratory, at Buffalo, in conjunction with Dr. Gaylord. The work started from the study of two mice infected with cancer brought to this country from Professor Jensen of Copenhagen. These animals—which were suffering from subcutaneous carcinoma simplex—died before reaching Buffalo; but inoculations from their tumors, though unsuccessful in the first and second experimental series, finally "took" in a large percentage of the descendants of these inoculated animals (hereditary predisposition?) and the investigators then had cancer experimentally produced on which to work. For the inoculations the tumor material was macerated in twice its weight of sodium chloride and injected subcutaneously. A tumor appeared locally (on the average in about 40% of selected cases), the animal grew cachectic, the blood count fell and the growth became, in a few months, nearly as large as the experimental animal. During the course of the work the

cancer material became attenuated and a certain number of animals with small tumors recovered spontaneously. It was from these recovered mice that immunizing serum was obtained for subsequent experimentation. A series of mice were inoculated with the cancer; half of this number then received a dose (.2 ccm.) of immunizing serum and the other half were kept as controls. This experiment was tried on animals with small, with medium, and with large tumors. In almost every case the difference between the history of the immunized mice and the "controls" was quite marked. In the former small tumors disappeared in about five days, larger tumors diminished to ½ their original size; in the latter, the disease took its usual progress. All the control animals are now dead; all the immunized animals (with the exception of one, dead from infection) are still alive. Later corroboratory experiments, while not quite so satisfactory as the earlier ones, gave in a general way always the same results. Tumors larger than a small cherry were never cured but treatment reduced their size, and rendered them more easily operable. Mice cured by serum immunization had sera capable of further curing, or at least counteracting, the disease. The sera of animals whose tumors had been improved by X-ray treatment were studied but they proved not to be protective. The protecting body of this immunizing serum was not a cytolysin, possessed no particular hemolytic activity and precipitive tests all gave negative results. Its protecting activity was not great and a large dose was necessary. The hope for the application of these results to human cancer lay, of course, in obtaining a case of spontaneously cured (or possibly even improving) cancer and then testing the serum of this patient for protective or curative powers.

Pathological Changes. Dr. Welch.

Dr. Welch discussed the microscopical features of the specimens showed by Dr. Clowes. The tumor produced in the mice was, he said, of the solid or simplex type, without acini and made up of polymorphous cells. The stroma was well developed and the connective tissue quite cellular. In the immunized animals the microscopical picture showed a striking change. In the larger tumors retrogressive metamorphosis was shown by necrosis of many cells at the center by diminution in size of both protoplasm and nuclei of cells still preserved at the edge. In the smaller tumors it was almost impossible to tell that a carcinoma had ever been present, the picture being almost that of an inflammatory granuloma with multinuclear giant cells, necrotic center and vascular connective tissue shell. The observation of Drs. Clowes and Gaylord was, he said, a new and most important one. It offered at least a ray of hope for the treatment of human carcinoma; and while there was, as Dr. Clowes had said, a mathematical possibility that in the mice subsequently treated with serum, the cancer inoculation had led only to the development of an inflammatory new growth while in all the other cases it had produced true cancer and that the results had, therefore, been purely accidental he felt this chance to be almost infinitesimal and the experiments practically conclusive within their own limits. It was extremely improbable that the serum of any animal would have the slightest effect on any human being; a spontaneously cured human being would have to provide the serum.

Apparatus for the Treatment of Fracture of the Femur. Dr. Theodore Dunham.

This apparatus was described by Dr. Dunham who devised it 10 years ago and has been using it successfully ever since. It consisted of a plaster spica of the hip, connected with a plaster bandage of the lower leg by two long metal plates incorporated in the two plaster dressings and fastened together by seizing. In applying the apparatus the plaster bandages were first put on and the metal plates incorporated. Extension was then made in the required direction and the two metal plates lashed together. Coaptation splints might be added for older children but were not indicated for young infants in whom the thigh might be put up at right angles, giving the natural position for nursing. The apparatus gave a constant extension, was simple and easily applied, did not necessitate keeping the patient in bed, did not interfere with the routine of life, allowed the thigh to be frequently examined without removing the dressing and had given excellent results. It was necessary to reapply the seizing at intervals in order to take up slack and keep extension perfect. Size and muscularity made the treatment unsatisfactory in adults.

Treatment of Esophageal Stricture.

Dr. Dunham also demonstrated a method of treatment of "impassable" stricture. A silk thread was passed into an ordinary drinking tube and its loose end allowed to float in a glass of water. The water was then sucked from the glass by the patient through the tube and the silk thread was in this washed down the esophagus. Its lower end could then be caught through a gastrostomy wound and the stricture sawed by the method of Abbé. If regurgitation occurred or the patient resisted with his tongue, the thread could be passed through a rubber tube, inserted into the nostril, and could then be washed down by pouring water into an attached funnel. The lower end of the thread could then be caught through a gastrostomy and the upper end fished out from the pharynx. An instrument for cutting strictures was also shown consisting of a guide bougie on which was locked an olivary-tipped dilator. Through the olive ran a cord, the two ends of which were brought out through the patient's mouth. The filiform guided the dilator, the stricture being thus put on the stretch by the olive and sawed by the string. This allowed further dilation and was followed by further sawing.

A wire and spindle dilator was also shown provided with rubber-protecting tubes for portions of the esophagus both above and below the stricture; and demonstrations of the use of the thread method were given on an apparatus constructed to represent esophageal stricture. Dr. Finney said that the great difficulty in these cases was in once getting something through and that Dr. Dunham had made an important con-

tribution to the solution of this problem. He himself had modified Abbé's method by simply tying knots in the cord and after passing these through fastening larger and larger bits of gauze for the purpose of dilatation.

Peri Pancreatic Abscess. Dr. Thayer.

The case reported by Dr. Thayer was of a woman, aged 51, who had been taken, in June, with epigastric pain and jaundice. From this she recovered but shortly afterward had an attack of very severe abdominal pain accompanied by jaundice, fever, nausea, and vomiting. Fever was intermittent in character and there were night sweats. She complained of a "sore pain" in the left abdomen where there was a slight prominence, especially above the iliac crest. A deep mass could be felt which did not reach to the perinephric region. Two weeks later, however, it had reached the loin and the kidney. Operation was performed by Dr. Finney, a peripancreatic abscess with fat necrosis being found and drained. Four similar cases had been seen at the Johns Hopkins Hospital characterized by abdominal pain (the onset being, in some cases, exceedingly severe), usually jaundice, fever, sweats, sometimes chills and, on palpation, a deep mass. This might be felt in the pancreas region but in some cases extended much beyond it, even going well over to the right side. The clinical symptoms were fairly characteristic and the diagnosis could usually be made without urine, and stool examinations, which, to be of value, would be quite complex chemical procedures. Possibly the test for a fat-splitting ferment in the urine might be of use.

Surgical Treatment.

In peripancreatic abscess Dr. Finney said the surgeon could either do nothing or accomplish much by doing little. Opening and drainage were the essential features. If the case was seen early it was better to do this in two stages—the tumor being isolated by gauze in the first and opened in the second after peritoneal adhesions had formed.

February 6, 1905.

Gastric Tetany. Dr. Howard.

Dr. Howard gave the clinical report of a patient who died in the Johns Hopkins Hospital with this condition. The man was 58 years of age and had suffered for years with attacks of indigestion characterized by gastric pain relieved by vomiting. There had never been blood in the vomitus. For three years before admission attacks of vomiting were frequent, large amounts of sour stomach contents being brought up. They were, however, much improved by the regular use of the stomach tube. Previous to this regular lavage there had also been several typical attacks of tetany, but they too disappeared with the use of the stomach tube. The patient, however, began to lose weight and strength and consulted Dr. Osler in November, 1904. A dilated stomach was found, peristalsis was visible and a surgical operation was advised. This was, however, postponed and the patient returned to the hospital in January, 1905, much improved. During his stay in the ward he was one day suddenly seized with epigastric pain (following a dietary indiscretion), and some pain and cramps in the extremities accompanied it. Relief followed the use of a stomach tube; but an attack of tetany supervened. Every muscle of the body went into tetanic contraction, the typical contracture of the hands being present as well as carpopedal spasm. Pain was agonizing, the face became purple and sweating was profuse. Trousseau's symptom was present. For twenty-four hours there was almost complete suppression of urine, and death occurred in forty hours, the patient being in a state of semicoma for the last twelve hours, during which time tetanic attacks were provoked by merely touching the patient's bed. There had been, Dr. Howard said, seven other cases of tetany in the Johns Hopkins Hospital. One was associated with repeated pregnancies, one came on after a severe fright, another was accompanied by a severe diarrhœa, and a fourth by tuberculous meningitis. The remaining three had been gastric cases associated with dilatation, hyperacidity, and hypersecretion. In adults the following forms of tetany were usually recognized: the epidemic, the gastrointestinal, the toxic (chloroform, etc.), and the forms accompanying pregnancy, acute infectious diseases, nephritis, nervous diseases, and thyroid extirpation. The cause of gastric tetany has been much discussed. Kussmall thought that dehydration was the essential feature, others noting the frequent occurrence of attacks of tetany after the use of the stomach tube in patients with the disease, explained the phenomenon as a reflex. Toxines from decomposing stomach contents had also been suggested as an hypothesis to account for the condition and a certain peptotoxin had been isolated by the French. The condition was said to be rare, was usually associated with gastric dilatation, hypersecretion and pyloric stenosis. The disease is very fatal—sixteen deaths occurring in a series of twenty-seven cases collected by Riegel.

The Pathology of Tetany. Dr. MacCallum.

It was to be noticed, Dr. MacCallum said, that the disease occurred in conditions associated with the elaboration of toxines; and there were certain experimental findings which added support to the toxine theory. If, for instance, tetany were artificially produced by extirpation of the parathyroid (*not*, as the books said, of the thyroid) the tetany could then be relieved by removing the animal's blood and replacing it with salt solution. Cure, at least temporary, could also be effected by the use of parathyroid emulsion. The tetany following extirpation of the parathyroids was, in brief, a specific form. The patient reported by Dr. Howard had proven at autopsy to have five pairs of parathyroids instead of the usual four, and these had shown on section numerous mitotic figures (a rare finding in normal parathyroids) as though the parathyroids had become hypertrophied to neutralize large absorption of toxine from the stomach. Dilatation of the stomach was enormous, the capacity being 4¾ liters, and the organ reaching to the right iliac fossa. There was great contraction of the pyloric orifice which measured 5 x 2 mm. Micro-

scopically the tissue at this point did not show the typical picture of a healed gastric ulcer, but Dr. MacCallum was inclined to think that such had been the origin of the pyloric stenosis. The sudden death which occurred so often during the early history of thyroid surgery had been due, he said, to extirpation of the parathyroids. It had ceased to occur when complete thyroid removal ceased to be done, and the reason for this had been that the parathyroids were left in. Sudden death, however, associated with features of intoxication and occurring in goitre patients, was difficult to explain. It had been thought to be due to a leakage of colloid material, but experimental work had shown this to be not the case.

Synaesthesia. DR. H. L. SMITH.

Dr. Smith read a paper on this subject reporting several cases. The word was used, he said, to mean the occurrence of constant and involuntary association of irrelevant subjective symptoms in response to certain stimuli. "Sound-feelings" for example occurred in many normal individuals, the disagreeable shiver when glass is scraped being a familiar instance. "Sight-feelings" were also quite common; and the statement had been made that 12.8% of all persons were normally synæsthetic. The association of letters and musical tones with colors was not infrequently seen and some musicians were said to tune their instruments by color sensations. Number synæsthesia was one of the commoner forms—numbers being conceived of as occupying definite positions in space, usually on a geometrical figure. Statements as to the physiological or pathological nature of this condition varied, but there seemed little doubt that heredity was an important factor in the etiology. The cases reported were all members of the same family, the father, four sons, and two daughters being affected. The synæsthesia took various forms in the different members, the association of colors with letters, of space position with numbers, of ideas (independent of their meaning) with words being prominent forms in the family. Transmission was plainly from the father, and all the members of the family were of a high grade of mental development. In each case the synæsthesia was most intense in youth and faded with the advance of age. Dr. Hurd reported a similar case, the patient being a person of fine intellect and unusual musical talent, but of a nervous temperament. Dr. Thayer reported a case of number synæsthesia in which the calendar was always thought of as being a definite geometrical form (an octogon), each date having its own position thereon. In this patient the alphabet was always thought of as a spiral and there was a definite geometrical scheme for the numbers. No color synæsthesia, however, existed.

Hanging Block Cultivation of Bacteria. DR. FORD.

Dr. Ford described Hill's method of growing organisms and observing their morphology during their growth. The early discussion as to the nature and classification of bacteria had, he said, obscured their relation to disease and Koch had been led to propound his famous dictum that the biological nature of organisms was immaterial so long as they were constantly found in association with the same disease process. The recent work of Westbrook and of Hill had, however, thrown a good deal of light on the morphology of bacteria. An organism was shown which had been thought to be one of the simple pigmented bacteria but which, in hanging block showed definite mycelial growth.

The Ultraviolet Rays.

Dr. Ford also reported some experiments he had made on the effect of the ultraviolet rays on bacterial growth. A quartz prism, a cadmium spark, and an agar plate of *B. prodigiosus* were used. Within the ultraviolet rays and reaching to the limit of the violet rays (*i. e.*, including all wave lengths from .00034-.0002175) bactericidal action was evident. Beyond these limits there was none.

Thermophilic Bacteria.

During the sterilization of some blood-serum tubes in Dr. Ford's laboratory at 57° C. a growth was found to have occurred on the tubes. The organisms were plated and were found to grow only slightly below 40° C. and rapidly at higher temperatures. They were long, spore-bearing bacilli. Similar organisms have been described by Novy, by the Italians, and by Rabinovitch, who isolated several forms from decomposing manure. The various forms are all much alike, all bear spores and do not grow on ordinary media. They cannot be differentiated except by the fact that some do and others do not liquefy gelatin.

February 20, 1905.

The Cure of Uterine Cancer. DR. JOHN G. CLARK.

Dr. Clark reviewed the recent literature on this subject, drawing conclusions as to operative treatment from the statistical studies which had been published. Radical and complete operation had aroused, Dr. Clark said, bright hopes as to the solution of the problem of the treatment of cervical carcinoma. The ultimate results had, however, been disappointing and led the speaker to take a pessimistic view as to the value of the complete operation. Up to the time of the publication by Dr. Clark in 1896 of a review of the experience of the Johns Hopkins Hospital with uterine cancer vaginal hysterectomy had been the operation done there; and the results of a series of forty-eight cases, though as good as in any hospital, were distressingly bad. It was then suggested that carcinoma of the uterus ought to be treated as carcinoma of the breast had been and an attempt was made to adopt the Halsted procedure for breast and axilla to the uterus and pelvis. Experience with this operation had, however, not given the results hoped for, and Dr. Clark did not think that complete dissection of the pelvis offered much for the future. Absolutely complete removal of all the glands was impossible; the prognosis might still be bad even if all the glands *were* removed; a large proportion of patients are quite inoperable when seen at the clinic; and death has usually been from local recurrence. These facts do not warrant one in expecting results in uterine cancer simi-

lar to those which have been obtained in breast cancer. The composite experience of various operators has also offered nothing to show that the complete operation accomplishes enough to offset its very much greater primary mortality. Reis, among the early writers, thought metastasis an early phenomenon and advocated complete glandular removal. Cullen and others said that metastasis to the glands did not take place early; but Wertheim, studying serial sections, found the glands involved in 31.7% of all cases and claimed that many metastases had been overlooked by others. Schauta, who advocates radical removal of the growth and not a prolonged search for metastases, divides the pelvic glands into six groups—the sacral, the iliac, the aortic, the cœliac, and the deep and superficial inguinal. Groups 1 and 2 are operable; groups 3 and 4 inoperable; while groups 5 and 6 did not usually enter into the question. Schauta reported sixty cases with eleven deaths, the prognosis varying notably with the site of the glandular metastasis. He found also that the extent of the disease was no criterion at all of the extent of the metastasis; and that the *size* of glands was of no clinical value in deciding on whether or not they were involved. No one has yet explained why some early uterine carcinomata metastasize while other late ones do not; nor why certain glands may be skipped by the metastasis; nor why large glands may be free from cancer while small neighboring ones are involved. It is probable that not the glands alone but also the lymph vessels, veins, and surrounding tissues offer routes for the growth. Kundrath has shown that the growth may take place in several ways; first, by mass growth from the cervix, usually circumscribed, but in some cases with finger-like processes; second, association of circumscribed growth with metastases; and third, combinations of 1 and 2. Wertheim, in his 1901 report, said that unless the glands were enlarged they need not be removed. This is now known to be incorrect; but removal of glands, at any rate, is of prognostic and not of curative value. Dr. Clark's own opinion is that more is lost than gained by an attempt at complete glandular removal—a prolonged procedure with high mortality. While he thought the complete operation ought to be given a good trial by careful and competent men he did not expect much from it and personally never did the complete operation—removing all the growth and as much neighboring tissue as possible by means of the cautery (abdominal incision), but making no attempt to get out the glands. Olshausen, who uses vaginal hysterectomy, has reported a series of over six hundred cases, 31% of which were operable, and 18% remained well after five years. As to the future, something might be hoped for from the work being done to develop treatment other than surgical. From the operative standpoint the outlook was not bright. It was absolutely necessary to have the diagnosis made early when the cases could be saved by surgery—and physicians and laity should be educated (as they have been in Germany by the efforts of Winter) to watch all symptoms at the time of the menopause and always to report promptly uterine hemorrhage.

Pathology of Cervical Cancer. DR. SAMPSON.

Dr. Sampson reviewed the pathology of this condition as illustrated by the cases seen at the Johns Hopkins Hospital. In the cervix cancer is more frequent than in the fundus, spreads more rapidly, is attended by a higher mortality and a lower percentage of cures. It is the most frequent form of primary cancer, is a disease of midlife and is frequent in those who are bearing children. It thus takes away valuable members of society when they can least afford to be missed. At the present very little is being done by way of surgical cure. Seventy-five per cent of the cases that come to the clinics are inoperable; recurrence occurs in three-fourths of the cases operated upon; and in practically 93% of all cases there has been simply no cure. Early diagnosis and complete removal of the growth—but not of the glands which are, when removed, of prognostic value only—offer the only hope of cure, the cases being curable early and operability increasing the earlier the disease is seen. Sixteen of the cases at the Johns Hopkins Hospital were living five years after the operation and four ten years after. Dr. Cullen said that he used Wertheim's operation, and did not dissect out the glands. Dr. Bloodgood said that the problem in uterine cancer was like the problem in cancer elsewhere; and that an extensive local operation should always be done. In the stomach complete glandular removal was attended by so great a mortality and the chance of recurrence was so great as not to justify the operation. In the breast the problem was simpler. There was practically no mortality from the operation; and, in the cases at the Johns Hopkins Hospital over 45% have remained cured for three years. In cancer of the lip glands were easy to remove, the tumor was usually noticed early, and the mortality of the operation was small.

NOTES ON NEW BOOKS.

The Practical Application of the Röntgen Rays in Therapeutics and Diagnosis. **By WILLIAM ALLEN PUSEY, A. M., M. D., Professor of Dermatology in the University of Illinois; and EUGENE W. CALDWELL, B. S., Director of the Edward N. Gibbs Memorial X-Ray Laboratory of the University and Bellevue Hospital Medical College, New York. Second edition, thoroughly revised, and enlarged. 690 pages, with 195 illustrations, including four colored plates. (*Philadelphia, New York, London: W. B. Saunders & Co., 1904.*)**

The fact that this excellent work has attained the distinction of two large editions in one year is proof of its value.

A practical feature of the work is that nearly all the cases and illustrations are based upon the author's own experience. This edition contains a review of all the literature of X-ray therapeutics to date, and, as the author points out, but little new has been added to our knowledge, yet it is of the utmost value in confirming the earlier claims as to the value of the X-ray from a therapeutic standpoint.

The important feature in the work is the sane judgment of the author upon the therapeutic value of the Röntgen rays in deep-seated neoplasms. His view upon the subject is as follows: "The extravagant hopes of enthusiasts as to the cure of the gravest malignant neoplasms has not been realized, but if this

excessive demand upon it is eliminated, it has more than fulfilled the prospects of usefulness which it at first seemed to offer."

Part I of the work is devoted to apparatus and the technique of radiography. Part II, the larger section, deals with the therapeutic effects. The treatment of the various diseases is taken up in detail and supplemented with reports of a great number of cases. Each chapter has an excellent bibliography attached.

The work is a most excellent one, not only from its usefulness, but also as a book of reference.

Eye, Ear, Nose and Throat Nursing. By A. EDWARD DAVIS, M. D., and BEAMAN DOUGLAS, M. D. With 32 illustrations. (*Philadelphia: F. A. Davis Co., Publishers, 1905.*)

Any nurse who expects to care for cases in the Eye, Ear, Nose and Throat can read with profit the pages of this book. It not only describes in detail the nurse's duties in these cases, but also gives a short account, in simple language, of the diseases themselves, and of the operative procedures undertaken, and thus puts the nurse in a position of coöperating more intelligently with the physician. The book contains a number of valuable suggestive points, which will be found of interest, not only to the nurse, but to the general practitioner as well, into whose hands a large number of these cases fall at first. It is well printed, in the main well arranged, and contains an excellent index.

Appendicitis. By BAYARD HOLMES, M. D., Professor of Surgery in the University of Illinois, Attending Surgeon Chicago Baptist Hospitals. (*New York: D. Appleton & Co., 1904.*)

While the greater part of this book is devoted to the subject of appendicitis, certain other diseases of the abdomen are discussed, namely, peritonitis, intussusception, perforating typhoid ulcer, and carcinoma of the intestinal tract.

Appendicitis is discussed thoroughly and in a most interesting manner. There is a short account of the history of the disease and then the anatomy of the appendix and the pathology, symptomatology, diagnosis, complications and treatment of appendicitis are considered.

The author discusses briefly the origin of pain in appendicitis and calls attention to the fact, now generally known, that the visceral peritoneum is practically insensitive to pain, whereas the parietal peritoneum is exquisitely sensitive. He says, "the origin of pain in appendicitis is hard to explain and no absolute demonstration of it has yet been given."

He gives a good, but perhaps somewhat exaggerated account of those cases of chronic appendicitis giving rise to indefinite and varied symptoms, the cases sometimes known as "grumbling appendices."

In the chapter on the complications of appendicitis the author mentions the cases with abscess involving the iliacus muscle, causing flexion of leg, etc., cases with subphrenic abscess and those with gangrene of ileum or cæcum. Among the complications and sequelæ, he does not mention post-operative intestinal obstruction, which is not a rare occurrence in most hospitals.

He condemns those who recommend the so-called expectant method of treatment in certain acute cases of more than 24 hours duration.

The author allows many of his cases to get up on the second day and to leave the hospital in four to five days. It seems to us that this is unnecessary haste.

An Introduction to Vertebrate Embryology, Based on the Study of the Frog and the Chick. By ALBERT MOORE REESE, Ph. D. (Johns Hopkins), Associate Professor of Histology, Syracuse University. (*New York: G. P. Putnam's Sons, 1904.*)

This little book is designed to give in a brief and convenient form an outline of the development of the common frog and the chick. As the author has stated, it is largely a compilation from larger and more expensive books such as Marshall's or Minot's Embryology. It gives an outline of the main stages in the embryological development and will be of service to those who wish a general survey of the subject without going deeply into it. The medical student will find that histology and pathology are only to be grasped clearly from the point of view of development and hence he will do well to gain as clear an idea of embryology as possible. The book is well illustrated, there being 84 figures selected wisely from various sources.

Atlas and Epitome of General Pathologic Histology. By DR. H. DÜRCK, of Munich. Edited, with additions, by LUDVIG HEKTOEN, M. D., Professor of Pathology, Rush Medical College, in affiliation with the University of Chicago. With 176 colored figures on 80 lithographic plates, 36 text-cuts, many in colors, and 371 pages of text. (*Philadelphia, New York, London: W. B. Saunders & Co., 1904.*)

This volume, which treats of various general processes in pathology such as degenerations, inflammation, repairs, etc., and of tumors, is part of the work on Pathology by H. Dürck, of which the portion devoted to special pathological anatomy has already been reviewed. It is the translation from the German edition, edited with many notes by Prof. Hektoen. The text reveals Prof. Dürck's broad knowledge of pathology and of literature on the subject toward which he maintains a critical attitude. It is strikingly clear, logical and sane throughout, and Prof. Hektoen has secured for it a pleasing English style.

The illustrations, though, are incomparable, both on the judicious selection of the preparations for which they were drawn, and from the wonderful perfection of their execution. The drawings of the tumors are not all so good as those in the first part of the book, but even so they are approached only by those of Borst's book on tumors. Finer illustrations have rarely been seen in any medical publication.

These plates together with the excellent text make the book extremely valuable to students, and should give it a place among the best works on pathology that have been printed in English.

International Clinics. A quarterly of illustrated clinical lectures. Edited by A. O. J. KELLY, M. D. Fourteenth series, Vol. III. (*Philadelphia: J. B. Lippincott Co., 1904.*)

The first part of this volume is devoted to discussion of certain phases of syphilis and its treatment, the most notable being a thorough review of the hypodermatic methods of treatment by Fournier.

Of more general interest is Lawrason Brown's contribution on the digestive disturbances in tuberculosis. This is a close and detailed study of a subject of much importance and full of practical information, preventive, dietary, and therapeutic, which Dr. Brown has drawn from his experience at Saranac and from the literature. T. R. B.

A Text-book of Pathology for Practitioners and Students. By JOSEPH MCFARLAND, M. D., Professor of Pathology and Bacteriology in the Medico-Chirurgical College, Philadelphia. With 350 illustrations. (*Philadelphia, New York, London: W. B. Saunders & Co., 1904.*)

A volume of about 800 pages with numerous illustrations, of which part are original, is added to our list of text-books of Pathology. Ten chapters are devoted to general pathology and ten to the special pathology of various organs. On the whole the book is good as far as it goes. Mention is made of nearly everything that one might expect to find described in a text-book of

pathology, and with a few exceptions the statements are correct. The book is characterized, however, by an extraordinary conciseness, such that the least advanced student must remain dissatisfied with what he finds on any particular subject. While the brief statements correspond well with the current opinion, this seems to be rather the result of success in consulting the best author upon the subject than of a wide consideration of the literature. More recent discoveries and the newer publications are very summarily dismissed. The original illustrations are not very good and there is practically nothing new in the book, either in text or method of arrangement. It is very doubtful whether such a summary, much of which consists essentially of definitions, is what is needed by students of the present day who have the intelligence and the will to read such living descriptions as are found in Orth's text-book and are not merely anxious to prepare for examinations.

Diseases of the Ear, for Practitioners and Students of Medicine. By JAMES KERR LOVE, M. D., Aural Surgeon, Glasgow Royal Infirmary; Lecturer in Aural Surgery, St. Mungo's College, Glasgow; etc., etc. With 54 Stereographic Photographs, 2 colored plates and many illustrations. (*Published by John Wright & Co., Bristol; and Simpkin, Marshall, Hamilton, Kent & Co., Ltd., London.*)

A very excellent work and one that is sure to meet the approval of the otologists. The concise, practical manner in which the really important subjects of otology are treated will appeal not alone to the student but to the busy physician. It is a book that one can really read with sustained interest for there is not a word too much said of any subject. It is, altogether, a strong presentation of practical otology.

It is the first time I have seen stereographic photography used in a text-book, and I am not sure it will prove a complete success. The pictures are excellent and I have long expected that some one would use just this method of illustrating the temporal bone, which is so difficult to show by ordinary photography or by drawing, but it is not easy to examine them as bound in the book. I hope the plan will meet with general favor. H. O. R.

Modern Ophthalmology, A Practical Treatise on the Anatomy, Physiology and Diseases of the Eye. By JAMES MOORES BALL, M. D., Professor of Ophthalmology in the St. Louis College of Physicians and Surgeons. With 417 illustrations in the text and 21 colored plates. (*Published by the F. A. Davis Co., Philadelphia.*)

The title of this book is certainly well chosen for the author has evidently tried to give us a book befitting the period. I know of no other single volume text-book of Ophthalmology that approaches this one in completeness of subjects considered; every conceivable affection of the eyes has been mentioned and, in most instances, the very latest knowledge concerning each topic is given.

The publishers, too, deserve commendation; the paper, the print and the illustrations are of the best. H. O. R.

First Report of the Anti-Malarial Operations at Mian-Mir, 1901-1903. By CAPT. S. P. JAMES, M. B. (Lond.), I. M. S. (on special duty). (*Office of the Supt. of Government Printing, Calcutta, 1903.*)

This report, which is issued under the authority of the Government of India, contains a detailed account of the investigations initiated by the Royal Society's Malaria Commission with the intention of demonstrating experimentally that malarial fevers can be prevented by practical measures based on the discovery that a particular species of mosquito is the definitive host of the malarial parasite. It is impossible to do justice to this interesting piece of work in the space available here, but the most important conclusions are these:

There appears to be no doubt that *anopheles culicifacies* is the chief, if not the only carrier of malarial organisms in Mian-Mir, which is one of the most unhealthy cantonments in India. The source of infection in the Royal Artillery Lines, where the investigation was carried on, was, beyond doubt, the children in the various Bazaars and followers lines. The results of the research show conclusively that the destruction of this species of mosquito, if carried out successfully, will effectually banish malaria, but such destruction is materially hindered by its difficulty and expense. In this connection, however, great importance is attached to the second set of experiments, namely, the attempt to lessen the effects arising from the obvious sources of infection in cantonments. It has been shown that this can be done by treating large numbers of native children regularly with quinine, and as this is a measure requiring no special knowledge and involving no great expense, it is applicable to every place where large numbers of native children are gathered in the vicinity of European troops.

The report is well worth reading by anyone interested in the subject, for it contains a great deal of interesting matter which cannot be condensed.

Traité d'Hygiene Procédés rapides de Recherche des Falsifications et Altérations. Par DR. P. SMOLENSKY, de St. Petersbourg; translated from the Russian by S. BRÖDO and A. ZAQUELMANN. Two volumes. (*G. Steinhal, Paris, 1904.*)

The early part of this work is devoted to the description of methods for analyzing the food-stuffs in ordinary use and of a character sufficiently simple and inexpensive to permit their being used in boarding-houses, asylums, hospitals, and even in private houses. The latter part deals with the hygienic questions associated with light, heat, clothing, the choice of dwelling houses, and other kindred subjects. The work contains much useful information and is well adapted for its purpose.

A Hand-book of Surgery. For Students and Practitioners. By FREDERIC R. GRIFFITH, M. D., Surgeon to Bellevue Dispensary, etc. (*Philadelphia, New York, London: W. B. Saunders & Co., 1904.*)

This work can hardly be considered more than a compend. It shares with so many works of this kind the advantage of being pocket-size, and has for its recommendation the fact that it is neatly bound in flexible cover; the paper used is of good quality and the type is large and clear.

The whole field of Surgery, including the specialties, is briefly outlined and there are brief chapters on Medico-Legal Surgery, Surgical Pathology and Technique.

The 417 illustrations, diagrammatic for the most part, supplement the text fairly well.

To the Practitioner its value will necessarily be very limited; to the Student preparing for quizzes and examinations it can be recommended as one of many.

The Channels of Infection in Tuberculosis. Being the Weber-Parkes Prize Essay, 1903. By HUGH WALSHAM, M. A., M. D. Cantab., F. R. C. P. (*London: John Bale, Sons & Danielsson, Ltd., 1904.*)

The Weber-Parkes Prize is given triennially by the College of Physicians in London for the best essay on some subject connected with tuberculosis, especially with reference to pulmonary tuberculosis in man. This prize was awarded to Dr. Walsham, in 1903, and this volume contains the essay.

The greater part of the work is taken up with discussion of the channels of infection. The work impresses one as rather a discussion of some of the questions coming under the head of infection, than a broad, comprehensive survey of the subject. Dr. Walsham is led into the discussion of side issues, which, however, are most important and of great interest. Thus he discusses the relationship of scrofula and tubercle. He has studied a number of cases at autopsy and comes to the conclusion that the so-called scrofulous gland is really a tuberculous one.

The channels of infection are considered under five headings:

1. Heredity.
2. Lymphatic vessels.
3. The blood-vessels.
4. Epithelial channels.
5. Inoculation.

Perhaps the most interesting section is the discussion of the question as to the frequency with which tubercle bacilli are absorbed by the tonsil or adenoid tissue. Out of thirty-four consecutive post-mortem examinations the tonsils were found to be more or less tuberculous in twenty. In some of these cases the tonsillar infection was perhaps secondary to the lung, but in others the primary source of infection seemed to be undoubtedly in the pharynx. The examination of tonsils and adenoid vegetations removed from the living patient was entirely negative. From his studies Dr. Walsham has come to the conclusion that the tonsils are very frequently affected. There is considerable space given to the question of renal infection.

The second part of the book takes up the conditions which render the tissues vulnerable; the relationship of alcohol, diabetes, cardiac disease, cancer, etc., to tuberculosis are dealt with.

Mention should be made of the illustrations, which are numerous and satisfactory.

Diseases of the Liver, Gall-bladder and Bile-ducts. By H. D. ROLLESTON, M. A., M. D. (Cantab.), F. R. C. P., Physician to St. George's Hospital, London. (*Philadelphia, New York, London: W. B. Saunders & Co., 1905.*)

To write a good book on any subject is difficult, but to write a good book on diseases of the liver would seem especially so. Those who have known Dr. Rolleston's work in the past have looked forward with much interest to the publication of this book, a work more ambitious than any he has yet done. Dr. Rolleston has had the advantage of a thorough training in pathology, the usefulness of which in clinical medicine cannot be over-estimated. The present volume is a model of what such a work should be. It discusses subjects in a broad way, and at the same time contains a perfect mass of details, well arranged and easy of reference. There does not seem any doubt that this is the best work we have on the diseases of the liver. Murchison's work is, of course, well-known but since its publication there have been many advances along various lines.

Dr. Rolleston, very wisely we think, omitted any description of the anatomy and physiology of the liver. The book opens with a short section on some anatomical abnormalities, some common post-mortem appearances and acquired deformities. Following this is a section on displaced and movable liver. After this is a chapter on functional disease. When we consider the important place which this takes in the popular mind (and we fancy to a greater extent in this country, especially the South, than in England) we realize its importance. Dr. Rolleston believes that many symptoms often attributed to the liver are really due to gastric and intestinal conditions. He emphasizes the importance of the treatment of these other conditions. The various disturbances of the portal circulation are discussed and the various morbid conditions of the lymphatic vessels. Changes in the liver secondary to cardiac conditions are described and there is an interesting section on pericarditic pseudo-cirrhosis. Acute congestion and acute hepatitis are also discussed.

The section on abscess of the liver is an interesting one. Dr. Rolleston points out the many difficulties of accounting satisfactorily for the etiological factors of some cases. There can be no question that amœbic abscess of the liver occurs without any dysentery, but it is only after the most careful examination of the bowel that the absence of intestinal lesions should be considered as proved. In a recent case one very small, almost healed ulcer, in the colon, was recognized only after most careful search. This should be kept in mind, as probably cases have been reported as having a normal colon in which a very slight ulceration had been overlooked.

The section to which one turns with the greatest interest is that dealing with cirrhosis. Various classifications are quoted but the author concludes that for practical work it is best to make a division into two probable types, (a) ordinary or common cirrhosis (portal), (b) biliary cirrhosis. A good comparison is made with some forms of kidney disease, portal cirrhosis being compared to a granular kidney and hypertrophic biliary cirrhosis to chronic parenchymatous nephritis. The terminal production of multilobular cirrhosis in a long-standing hypertrophic biliary cirrhosis corresponds to the contracting kidney following the large white kidney. There are so many interesting points which might be discussed in this connection that it is difficult to choose. For example, the cause of splenic enlargement in cirrhosis. Dr. Rolleston inclines to the toxæmic theory. There is a great amount of detailed information regarding the various conditions, as for example hæmatemesis, the discussion of which is exceedingly good. A point of great interest is as to the relationship of ascites to chronic peritonitis. Hale White considers that cases of cirrhosis with ascites but without chronic peritonitis never survive to be tapped more than once. It would be well if this point could be definitely settled. The subject of hæmochromatosis receives adequate notice. Biliary cirrhosis is taken up at some length and a very clear description given. It is impossible to do justice in a review to this section on cirrhosis. It seems one of the best descriptions of the subject which we have in English.

Tuberculous and syphilitic diseases of the liver follow. We should agree with Dr. Rolleston in thinking that hepatic syphilis is very often overlooked, and he does well in emphasizing the importance of bearing in mind the possibility of syphilis in obscure enlargements of the liver. There is a section on hydatid cyst and on fatty and lardaceous diseases of the liver.

Malignant disease of the liver is taken up under the headings of primary and secondary and many statistics are quoted. Very many doubtful points associated with jaundice are well discussed. The cases are divided into two classes, (a) the extra-hepatic or obstructive, (b) the toxæmic or intra-hepatic. The many causes which may give rise to jaundice are taken up at considerable length. If we ventured to make one suggestion it would be that Dr. Rolleston might have laid greater emphasis on the dangers of hæmorrhage from operations done on patients with jaundice. Preliminary treatment with calcium salts may greatly diminish the risk of bleeding at operation.

The second part of the book deals with diseases of the gall-bladder and bile-ducts. Acute cholecystitis and tumors of the gall-bladder are taken up first. The section on cholelithiasis is an excellent one. The diagnosis is fully discussed. The author takes perhaps the moderate view as to surgical treatment. During an attack of colic an operation is justified only if there be a special complication which might prove fatal, such as a rupture of the gall-bladder, etc.

In reference to operation after repeated attacks Dr. Rolleston takes a rather non-committal attitude, which is perhaps the safer

course, but the general tendency in the profession would seem to be to advise operation more frequently. The section on the general treatment of patients with gall-stones is a very excellent one.

The sections on morbid anatomy and histology are clear and satisfactory. In the discussion of the clinical material there is an excellent arrangement. The heads under which the various features are described are well separated and the reader has a clear idea of the whole subject as presented. Although many cases are quoted, they have been judiciously extracted and only the essential features are given. The material from St. George's Hospital has been extensively used. There are many references and it is pleasing to see how carefully the American literature has been extracted. The illustrations are good and there are a number of colored plates. Altogether we regard this as a most satisfactory work, and extend our congratulations to Dr. Rolleston on its success.

An Introduction to Pharmacognosy. By SMITH ELY JELLIFFE, M. D., Ph. D., Professor of Pharmacognosy in Columbia University. (*Philadelphia, New York, London: W. B. Saunders & Co., 1904.*)

This book is published with the intention of giving a work in compressed form dealing with the general anatomical characters of drugs. Dr. Jelliffe has described both their macroscopical appearances and microscopical characteristics. As the author points out, pharmacognosy may be approached from several sides, for example from the botanical point of view, the histological aspect or the special study of the constituents of the plant.

The book opens with a description of animal drugs, under which the leech and cantharis are described. Naturally the greater part of the work deals with vegetable drugs. The method pursued is to describe first the gross characters of the structure and then the histology, with a note regarding the chemistry. The descriptions are clear and the illustrations are satisfactory and helpful. The work seems to be admirably adapted for the purpose kept in mind and should be very useful to students of the subject.

Adolescence: Its Psychology, and its Relation to Physiology, Anthropology, Sociology, Sex, Crime, Religion, and Education. By G. STANLEY HALL, Ph. D., LL. D., President of Clark University and Professor of Psychology and Pedagogy. Two Volumes. (*New York: D. Appleton & Co., 1904.*)

Two methods suggest themselves for the accomplishment of the task the author of these notable volumes sets for himself. One consists of a simple statement of the facts of adolescence in their various relations; and the other, a most difficult, Herculean feat, the organization of these facts and their relation into a systematic philosophical study. The reader need hardly be told that to the latter Stanley Hall has addressed his energies. Many will recall the incident, made the subject of a newspaper story a few years ago, of the ambitious American student, who was given, as an initial task by his German professor, the study of a frog's muscle. Few know that Stanley Hall was the student. In his words, "The mild dissipation of a somewhat too prolonged general culture and a little taste for easy, breezy philosophical speculation caused at first a strong sense of repugnance from so small and mean a theme. When it was well under way, however, and with the daily and personal guidance of this master in devising methods of experiment, planning new instruments for record and stimulus, suggesting fertile possibilities, showing the details of all the technique, suggesting and placing in my hands new reading, etc., I found that I must know in a more accurate way than before certain definite points in electricity, which was the agent of stimulation; in mechanics, for the apparatus was complex, and there were possibilities of improvement and invention that might open up a new field of myological investigation; in the anatomy and physiology of other tissues for comparison; in chemistry, in order to judge something of the effects of the artificial blood for constancy; and in mathematics in order to compute and analyze the contraction curve into its components and to construct and interpret the records and tables. . . . As the work went on, I felt that the mysteries not only of motor education and morality, but of energy and the universe, centered in this theme, from the persistent study of which, although in the end I made but an infinitesimal contribution to the vast body of certain scientific knowledge in the world, I learned several great lessons, viz.: that any object, however unattractive, may be a key to the greatest themes; that narrow specilization is now hardly possible."

This reveals the author's method. The reason lies not only in the large number of adolescents, "one-third of the inhabitants of America and all so-called heathen people," but in the vast importance of this period of life, in which individual character is developed, formed and completed, and in the light of which all subsequent personal history is but a repetition or a demonstration of the destiny nurtured in adolescence, the "most fascinating of all themes, more worthy perhaps, than anything else in the world of reverence, most inviting study, and in most crying need of a service we do not yet understand how to render aright. . . . Here the young appeal to and listen to each other as they do not to adults, and in a way the latter have failed to appreciate. Again, no biography, and especially no autobiography, should henceforth be complete if it does not describe this period of transformation, so all-determining for future life, to which it alone can often give the key. To rightly draw the lessons of this age not only saves us from waste ineffable of this rich but crude area of experience, but makes maturity saner and more complete."

The work consists of two royal octavo volumes of, respectively, six hundred and seven hundred and fifty pages. In a general way the division into volumes represents a distinction between the physical and the mental or spiritual aspects of the subject. The eight chapters of Volume One are entitled Growth in Height and Weight; Growth of Parts and Organs during Adolescence; Growth of Motor Power and Function; Diseases of Body and Mind; Juvenile Faults, Immoralities, and Crimes; Sexual Development: Its Dangers and Hygiene in Boys; Periodicity; Adolescence in Literature, Biography and History.

It is not possible, even with generous allotment of space, to outline fairly in a review the scope of these topics. True to his own adolescent discipline in the investigation of the ranal gastrocnemius, the author describes the growth and function of the human body, not only by compilation of all available statistics, but by careful analogies with the life histories of all human and feral races and types. Thus the infantile movements of swimming are correlated with the stage of embryonic existence in which ichthyic evolution is represented; and the later phases of extra-uterine growth are shown to be represented, first in feral, later in savage ancestry.

From the category of diseases the author passes to juvenile faults, immoralities and crimes. Monstrosities, idiots, vagrants, itinerants, vagabonds, gadabouts, hoboes and tramps, their tendencies, sentiments and acts, make a most absorbing chapter. We may say, as Longfellow said of Dickens, "He is prodigal and ample, but what a crowd of villains he contrives to introduce us to." The reader who takes up the volume casually for pleasure and profit finds in the later chapters compensation for the tedious mustering of dry facts with which it opens. As in fiction, the initial chapters delineate the characters, who later display their passions, ambitions, purposes and ends. Here these culminate in

the eloquent chapter entitled Periodicity, the apotheosis of the feminine adolescent, revealing the deep pedagogical insight and affectionate instincts of the author's ideals. There exists, perhaps, no better analysis of the characteristics of sex, and his pleas, not only here but elsewhere, for the preservation of the complementary attributes of men and women, and his protests against their destruction, by whatever means;—the virilization of the one, and the feminization of the other, must stand as the strongest thesis of the many he attempts. In education, religion, mental training of whatsoever sort, this deplorable tendency is condemned. He strikes a forcible blow in a practical way at one source of feminine depreciation: "There are now, happily, signs of a reaction against the recent excessively surgical tendency, which has been too dominant, toward a larger view of the whole life of woman. Specialists are beginning to realize that they must broaden their view from the pathology of her organs, till lately so often doomed, if she once consulted them, to the entire problem of regimen, and know at least as much about woman as about her pelvic diseases. Indeed, not a few experts are beginning to recognize that this larger field is relatively unknown to them, and that they must begin the study of the new or higher gynecology with something like a Socratic confession of ignorance. As long as they hold any exclusive theory which consigns to either ovaries, tubes, or central nervous system, the exclusive dominance, or assume that either the psyche or soma is always primal or causal, little progress can be made. Each of the modern views is partially correct and must always be considered as a possible aspect of each case."

Volume Two consists of Chapters Nine to Eighteen inclusive, entitled: Changes in the Senses and the Voice; Evolution and the Feelings and Instincts Characteristic of Normal Adolescence; Adolescent Love; Adolescent Feelings toward Nature and a New Education in Science; Savage Public Initiations, Classical Ideals and Customs, and Church Confirmation; The Adolescent Psychology of Conversion; Social Instincts and Institutions; Intellectual Development and Education; Adolescent Girls and their Education; Ethnic Psychology and Pedagogy, or Adolescent Races and their Treatment.

The second volume to greater extent than the first is liberally illustrated by what in medical language would be termed a casuistry. The author's text is thus elaborated by sketches of Social Instincts and Institutions, including the student's organization of all countries, and associations of youth. The customs and histories of the races in "relation of greater or less subjection to a few civilized nations," the "Adolescent Races," are quite fully extracted from authoritative sources. The author's purpose in this coaptation of civilized youth and barbaric manhood is two-fold; first, the ethnic establishment of the adolescent in nature; and, second, as a plea for the uplifting of inferior humanity, for "every vigorous race, however rude and undeveloped, is, like childhood, worthy of the maximum of reverence and care and study, and may become the chosen organ of a new dispensation of culture and civilization. Some of them now obscure may be the heirs of all we possess, and wield the ever-increasing resources of the world for good or evil, somewhat perhaps according as we now influence their early plastic stages, for they are the world's children and adolescents."

In this closing sentence the author again, and finally, reveals his great sympathy as a teacher and leader of youth. Upon the apprehension of this sentiment by his readers will rest the success or failure of his book. From the enormous mass of material at his hand this professional instinct stands boldly forth, and beside it, the ventures into other fields sink into comparative insignificance. Thus arises question of his denial of the modern conception of "Narrow specialization." He has "tried to bring the subject-matter of each chapter within the reach of any intelligent reader." There are few "intelligent readers" qualified to exercise discriminating judgment upon such variant philosophies as those of religion, art, education, medicine, psychology, sociology and evolution. And a reasonable doubt may be expressed of the author's fitness to treat from the pedagogue's chair of the most disputed questions of conversion or of mental medicine. Surely the discussion of "dementia præcox" has not yet reached the stage when it may be easily handled by a layman. And in no medical treatise would such rhetorical blunders as "plexi" and the "Island of Kiel" escape the proof-readers of one of the most famous publishing houses of the world. The need of "narrow specialization" is still apparent. The phraseology of the author may be also open to question. It is difficult to comprehend very many of his statements without laborious analysis of his sentences. Students of medicine who are acquainted with the verbal simplicity of the German masters, who always reduce the most difficult problems to the simplest expression, so that all science becomes at once practical, will be surprised that stilted language should parade, even indirectly, under the ægis of Professor Ludwig, the hero of the frog's muscle. And the genial and plain-spoken Autocrat would writhe under the appellation given his "ophidian medicated novel, Elsie Venner."

Books inevitably assume one of two forms. They either contain the ideas of the author in the language developed in his processes of thought, which may prove ambiguous; or they set forth in plain, easily comprehended phrases, the crystallized results of thought, which carry a distinct meaning or conviction to the simplest reader. Stanley Hall's book may be placed in the first category, and must lose largely in effectiveness. It appears rather meristic and somewhat banausic in its treatment of the ephebic problems. In his psychonomic recapitulatory impulses the author reveals a trace of solipsism, which is thus found characteristic not of adolescence alone.

In spite of these defects the work is epochal. It centers attention upon the period of life in which character is developed. It reveals a marvellous amount of research and a most acute and analytical observation. The hope may be expressed that in abridged form, in simple diction, the author's knowledge of the training of youth, freed of compilations from philosophical fields in which he is but an observer, may be made available to all thinkers, the world over, who value the force in civilization of strong men and pure women.

J. M. Mosher.

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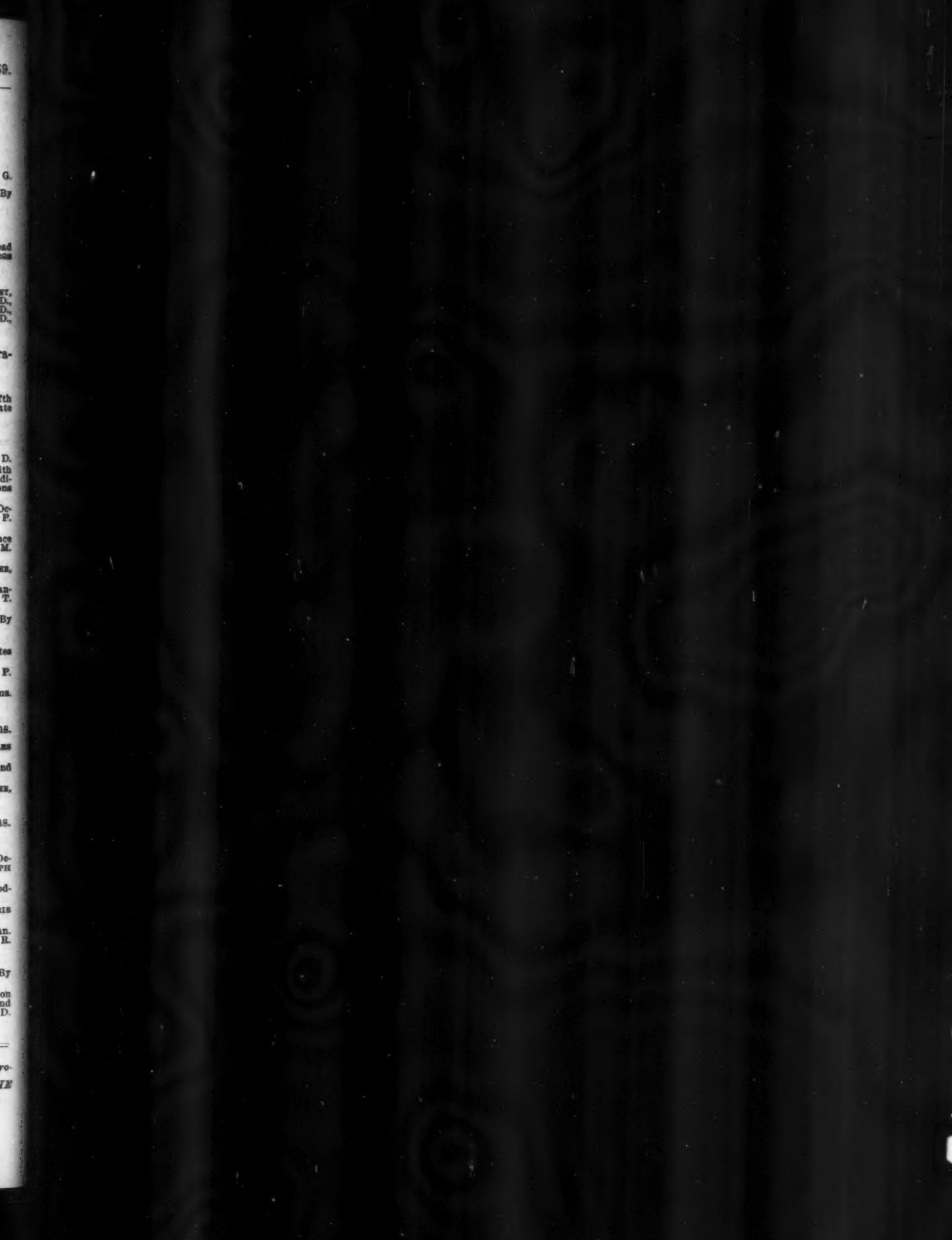
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